

Effects of Changing Economic Relationships On the Fed-Beef Production/Distribution System

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by

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During the last fifteen years, the cattle feeding/fed-beef system in the United States has been characterized by widespread structural and technological change under a rapidly changing economic environment. Modifications in the system, generated by increasing energy and labor costs, inflation, highly fluctuating livestock and feed grain prices, and the actions of concerned consumer groups, include adjustments in location and size of operations, in marketing strategies, and in patterns of distribution. The feeding sector is concerned with regional differences in feeding costs, feed supplies, feeder cattle supplies, economies of size in feedlot operations, feeding practices, etc. The slaughter sector is concerned with regional differences in fed slaughter cattle sources and supplies, slaughter and fabrication costs, economies of size in slaughter operations, demand for fed and nonfed beef, packaging and distribution costs, etc.[1]

Objectives and Procedure

The purpose of this study is to determine optimal location and volume of cattle feeding and slaughter within the United States and optimal distribution of feeder cattle, feed grain, fed slaughter cattle, and fed-beef among specified regions of the United States. In addition, the economic implications of regional changes in feed grain supplies and relative changes in transportation and slaughter costs between regions are examined.

A multiproduct transshipment model is used to examine interregional economic relationships in the cattle feeding and fed-beef system among 26 regions in the contiguous 48 states (Figure 1). The adaptation of interregional competition theory necessitates the selection of a point within each specified region to represent the geographic concentration of cattle feeding, cattle slaughter, and fed-beef consumption. Major cities close to the geographic center of

each region are designated as producing and consuming points.

A multi-product transshipment model as complex and as large as the model used in this study generates a considerable amount of detailed results, all of which could not be reported here. While the model may overstate adjustments in an industry, it remains a valuable tool for determining directions of potential system changes resulting from changing economic relationships.

Analysis of interregional competition in the cattle feeding/fed-beef industry requires the development of a considerable amount of detailed national and regional data relative to feeder cattle and feed grain supplies, feed grain and fed-beef demand, and transportation costs (Clary, Dietrich, and Farris, 1984b). In addition, estimates are developed relative to regional feeding and slaughter costs.

Four scenarios provide insights and guidelines for decision making in cattle feeding, cattle slaughtering, and related industries. Scenario 1 determines the competitive position of each region in the production and distribution of fed slaughter cattle and fed-beef in 1980 and is used as a base for comparative purposes. This scenario was validated by comparing optimum regional fed cattle marketings as determined in Scenario 1 with the average annual number of fed cattle marketed in each region reported in Cattle on Feed (USDA, 1980-81) from 1977 to 1980. Scenario 2 provides estimates of adjustments in projected feed grain supplies as a result of declining water tables in the Central and Southern High Plains and decontrol of natural gas prices.[2] Scenario 3 combines the assumptions of Scenario 2 with a 50 percent increase in regional variable slaughter costs. Scenario 4 combines the assumptions of Scenario 3 with a 50 percent increase in regional transportation costs.

Results

Scenario 1

The base scenario reveals that cattle feeding and slaughter firms in the Southern and Central Plains and the Corn Belt enjoy considerable competitive advantages over other regions--advantages similar to those described by Dietrich (1971) over a decade ago. These regions, especially West Texas-West Oklahoma, Kansas, and Nebraska have considerable locational advantages due to proximity to feed grain and feeder cattle supplies, access to growing fed-beef markets in the South and Southwest, and economies of size associated with the feeding and slaughter industries.

Optimum feeder cattle distribution and cattle feeding locations are shown in Figure 2. Feeder cattle generally move out of the northern and southeastern regions into Corn Belt, Southern Plains, and Central Plains feedlots. Other cattle movements include shipments from the Northwest to Southwestern feedlots and from Middle Atlantic States to Pennsylvania feedlots. Intraregional shipments are common and are represented by circles at selected points where appropriate.

Scenario 1 indicates that approximately one-half of the U.S. estimated feedlot capacity is unused when cattle feeding is allowed to occur on a least-cost basis in the cattle feeding/fed-beef economy in 1980. Most of the excess feedlot capacity exists in California, North Dakota-South Dakota, Minnesota-Wisconsin, Iowa, Illinois, Michigan-Indiana-Ohio, and Missouri.

Slaughter would generally remain production oriented as firms locate near large concentrated sources of fed slaughter cattle (i.e. feedlots) to ensure consistent supplies of fed cattle and to minimize fed slaughter cattle acquisition costs. Optimum flows of fed slaughter cattle to slaughter sites are illustrated in Figure 3. The six major cattle feeding areas (West Texas-West Oklahoma, Nebraska, Kansas, Colorado, Iowa, and Michigan-Indiana-Ohio) slaughter 85 percent of the fed cattle produced within their

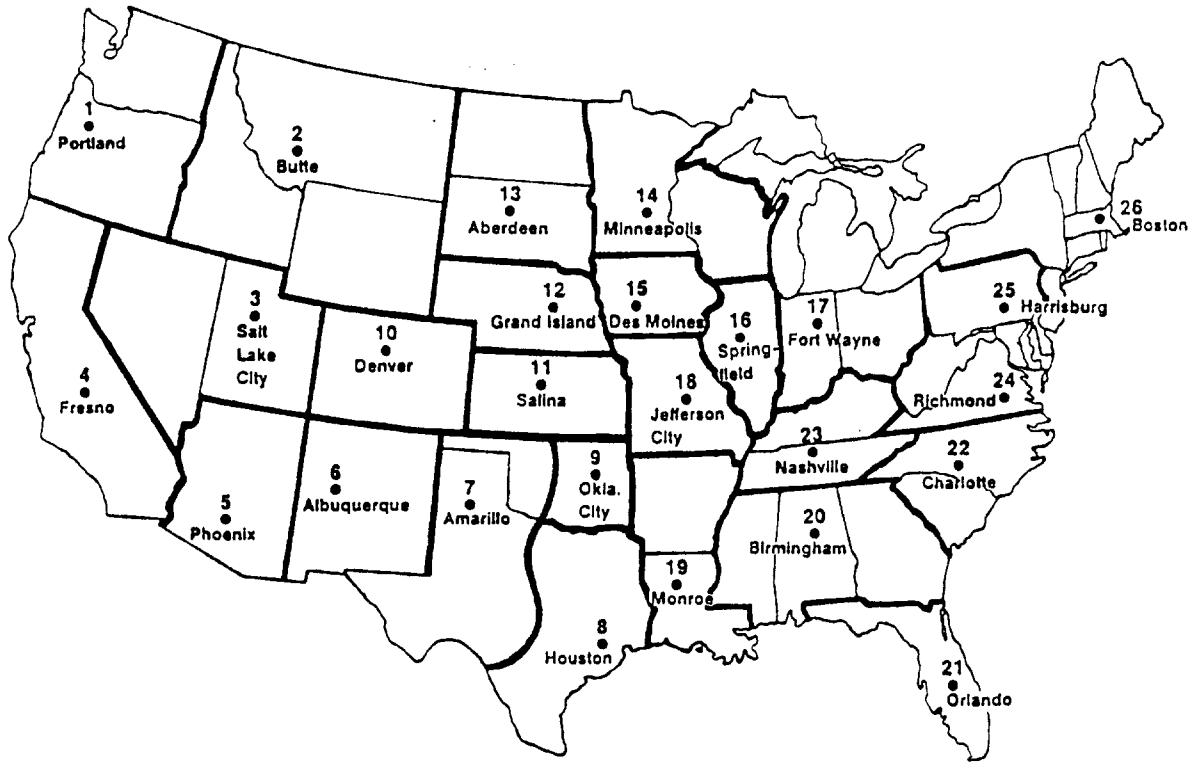


Figure 1. Regional demarcation and regional shipping and receiving points.

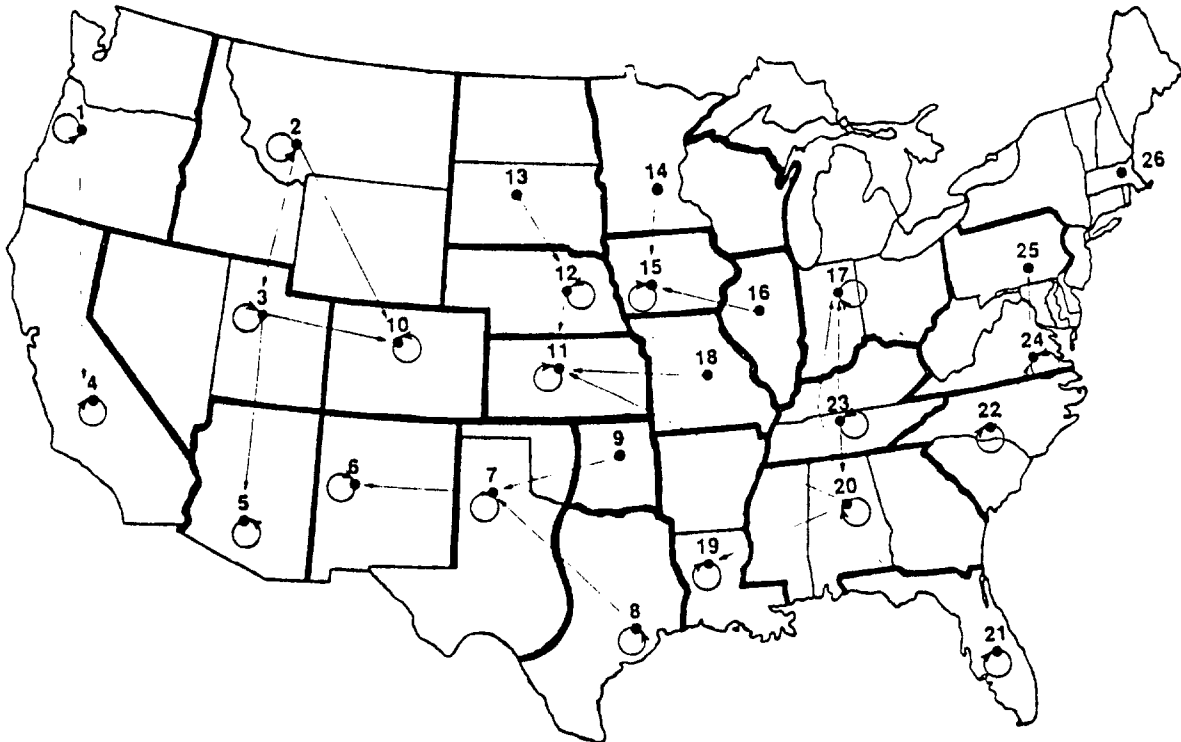


Figure 2. Optimum interregional flows of feeder cattle (Scenario 1)

own areas. The remaining fed cattle produced in these regions are shipped to slaughter plants in nearby areas. Surplus fed slaughter cattle movements are generally in a southern or southeasterly direction from Corn Belt and Plains feedlots. Such movements are mainly attributed to lower slaughter costs in the southern regions, generally resulting from relatively lower wage rates and excess slaughter capacity.

Optimum distribution patterns for dressed fed-beef are determined to a great degree by regional production levels, location and consumption levels of population centers, and regional differentials in production costs, transportation costs, and prices of finished products. Fed-beef production is characterized by concentrated slaughter in regions possessing significant competitive advantages in fed slaughter cattle supplies, slaughter plant capacity, and slaughter costs. Results of the base scenario reveal that approximately 90 percent of U.S. fed-beef production is shipped interregionally.

The two most populated regions, California and the Northeast, are large deficit fed-beef producing areas, accounting for nearly 30 percent of the total U.S. fed-beef consumption (Figure 4). Other areas requiring inshipments of fed-beef to meet demand include the North Central States, the Southeast and South, the Middle Atlantic States, and Pennsylvania. Surplus fed-beef production, as determined by Scenario 1, is concentrated in West Texas-West Oklahoma, Colorado, Kansas, Nebraska, and Iowa.

Fed-beef distribution patterns generally remain similar throughout this study. Variations in volumes shipped between regions are precipitated by changes in optimum fed cattle slaughter levels. Fed-beef is generally distributed to the West from slaughter plants in the Southern Plains and Colorado. Fed-beef is distributed to the East from slaughter plants in the Central Plains and the Corn Belt. The Northwest is relatively self-sufficient in terms of fed-beef production.

West Texas-West Oklahoma has significant locational and cost advantages in supplying fed-beef to deficit markets in the East and West. Slaughter plants in West Texas-West Oklahomasupply nearly 70 percent of the fed-beef consumed in Florida and over 30 percent of California's fed-beef consumption. This same area indirectly supplies nearly all of the fed-beef consumed in the Southwest, Southeast, and most Middle Atlantic States when transshipment patterns are considered.

Iowa and Nebraska enjoy a locational advantage in supplying fed-beef to the large deficit Northeast market. Kansas has a competitive advantage in shipping fed-beef to Illinois and Missouri. Kansas must compete with the Southern Plains for deficit fed-beef markets in Kentucky-Tennessee and the Atlantic Coast.

The various competitive relationships between West Texas-West Oklahoma, Colorado, and Kansas indicated by results of Scenario 1 raise important questions concerning recent industry trends. Large capacity slaughter plants in southwestern Kansas recently began operation. Since these plants are located relatively close to the Texas and Oklahoma Panhandle Plains slaughter area, it is likely that they can compete effectively for fed-beef markets, especially in souther regions.

Large slaughter operations with national systems of distribution located in the concentrated cattle feeding regions generally produce a relatively homogeneous product. Regions such as West Texas-West Oklahoma and Colorado, which compete for the California fed-beef market, tend to produce carcasses of similar size and quality. Such production practices suggest an increasing reliance on price competition in these markets. Those firms with the more efficient production and marketing practices will have increased chances of survival in the competitive cattle feeding/fed-beef industry.

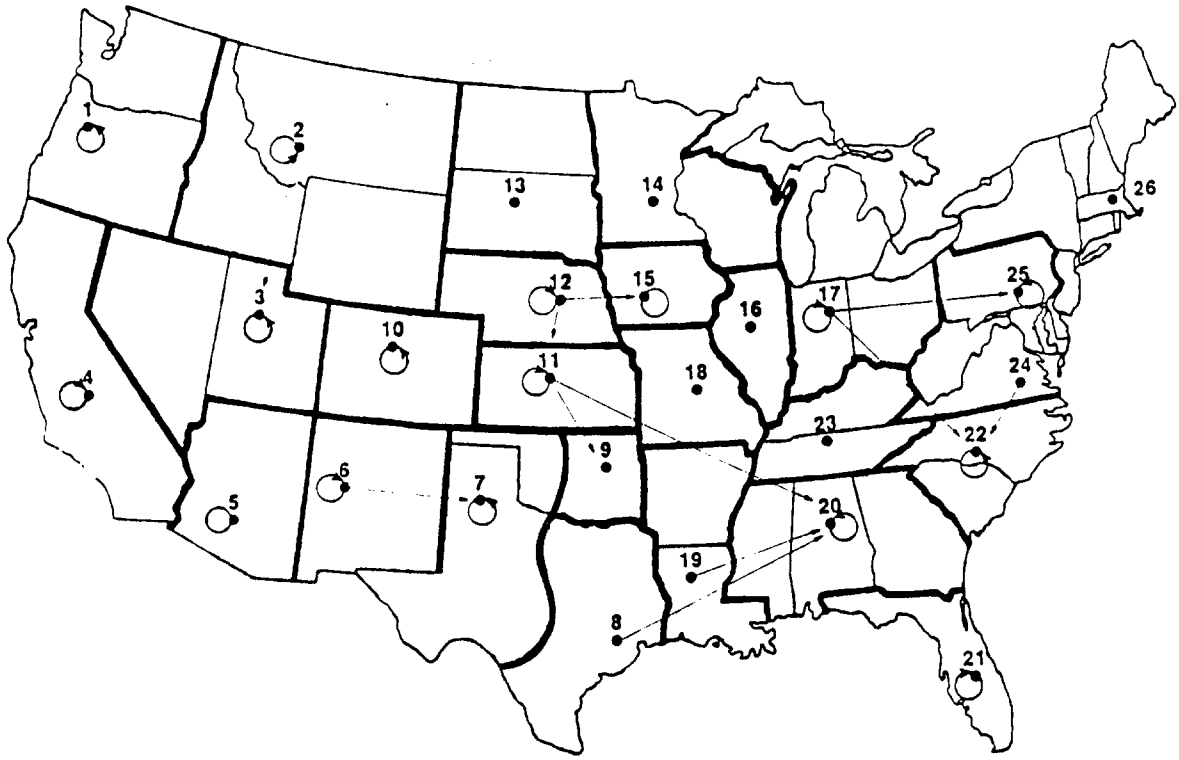


Figure 3. Optimum interregional flows of fed slaughter cattle (Scenario 1)

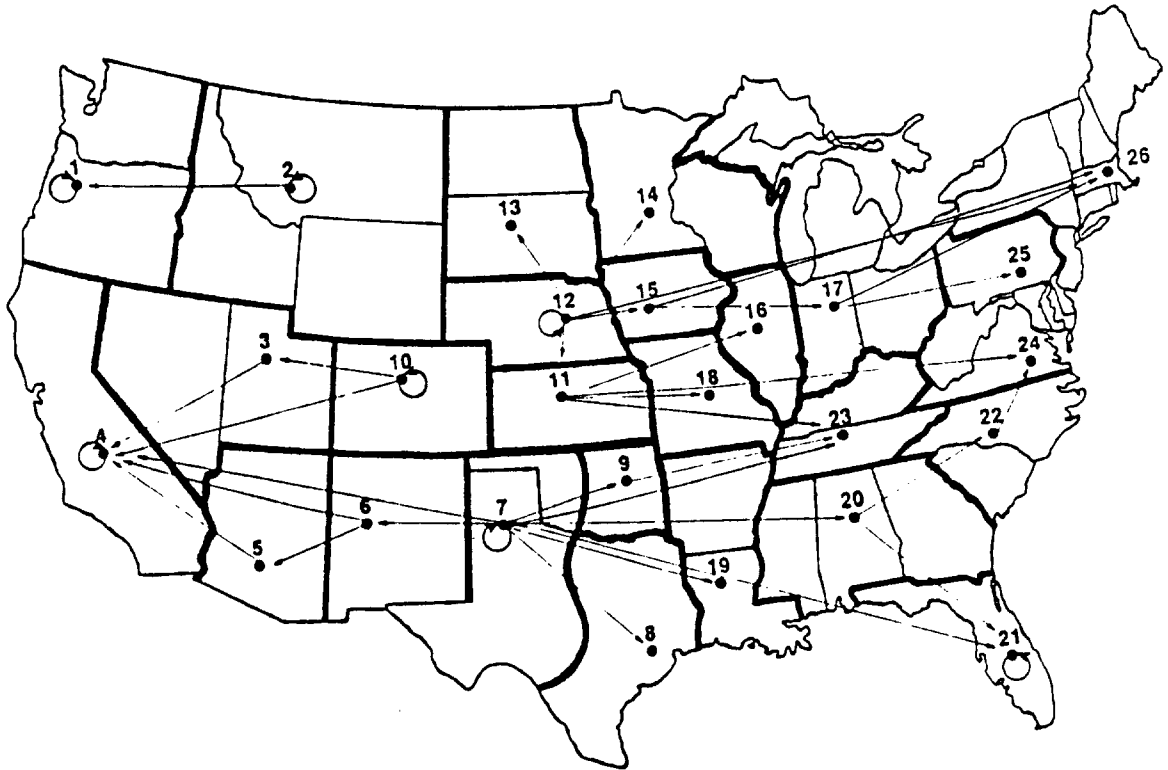


Figure 4. Optimum interregional flows of fed-beef (Scenario 1)

Scenario 2

Scenario 2 measures the effect of estimated changes in feed grain supplies and demands for 1990. The 1990 regional feed grain production levels reflect the projected effects of declining availability of irrigation water and deregulation of natural gas prices on irrigation practices, especially in the Central and Southern Plains.[3] Total quantity of feed grain demanded in 1990 for uses other than cattle feeding is estimated to increase 23 percent from 1980, resulting in a 14 percent decrease in the quantity of feed grain available to the U.S. cattle feeding industry.[4]

Results of Scenario 2 indicate that West Texas-West Oklahoma and Kansas possess strong competitive advantages in feeding and slaughter, as indicated by 100 percent utilization of available feedlot and slaughter plant capacities in these regions. Estimated changes in regional feed grain supplies tend to shift cattle feeding and slaughter activities from the eastern Corn Belt to the western Corn Belt and the Central Plains. These regions, especially Iowa and Nebraska, not only have significant locational cost advantages over regions to the east, but also have excess feedlot and slaughter capacity available to accommodate additional feeding.

Few changes occur in optimum fed cattle slaughter levels and fed-beef distribution patterns between Scenarios 1 and 2. Slaughtering levels increase in Nebraska, Colorado, and Montana-Idaho-Wyoming, but decrease in Mississippi-Alabama-Georgia. Fed-beef demand in Pennsylvania and the Northeast, previously supplied by southern packers, is supplied by packers in Iowa and Nebraska. Northwestern packers increase shipments to California while Colorado packers increase shipments eastward. California ships in fed-beef from Montana-Idaho-Wyoming to compensate for decreased in-shipments from West Texas-West Oklahoma. Results imply that Kansas plays an integral role in the transshipment of fed-beef from the Southwest to Middle Atlantic and Northeast consumption regions.

Scenarios 3 and 4

Some of the major concerns in the cattle feeding/fed-beef economy are the effects of increases in slaughter and transportation costs on optimum location and utilization of feeding and slaughter facilities and fed-beef distribution. Relative increases in regional input costs have implications for the immediate and longer run interregional competitive alignment within the system. In the past five years, several beef slaughter plants have closed and some have filed for reorganization under bankruptcy proceedings. High wages are frequently cited as a major cause. Scenario 3 measures the effect of a 50 percent increase in regional variable slaughter costs. Scenario 4 measures the effect of a 50 percent increase in both regional variable slaughter costs and transportation costs for all commodities included in the study.

Regional variable slaughter costs in Scenario 3 are the average U.S. variable slaughter cost in the base scenario adjusted by an index of meat packing plant hourly wages as reported in the Census of Manufacturers (1977 and 1980). If regional variable slaughter costs are increased 50 percent, in the absence of offsetting cost factors or services, major realignments in the location of fed-beef slaughter could result in regions with relatively high slaughter wage costs. These realignments consequently impact on fed-beef distribution systems. Major changes from Scenario 1 to Scenario 3 are 1) slaughter in Iowa is eliminated, 2) California slaughter is decreased one-third, 3) Kansas and Nebraska slaughter is increased almost 40 percent, 4) Missouri slaughter up to its capacity, and 5) some southern regions either increase or initiate slaughter. Other major fed cattle slaughter areas, such as West Texas-West Oklahoma and Colorado, are unaffected by changes in variable slaughter costs.

It is unlikely that fed cattle slaughter will be completely eliminated in Iowa in the foreseeable future. However, this scenario suggests that if slaughter and other associated costs remain at relatively higher levels in one region compared with

competing regions, the higher cost region will find it increasingly difficult to compete in interstate commerce. The longer run implications are that industries will relocate to lower cost regions, other things being equal or in the absence of offsetting considerations.

The implications of Scenario 4, in which regional slaughter and all transportation costs are increased 50 percent, are that interregional competitive feeding and slaughter advantages accrue to regions with surplus feed grains and fed slaughter cattle. Regions like West Texas-West Oklahoma, which have the ability to compete favorably with other cattle feeding regions under the current cattle feeding input and transportation cost structure, would not be adversely affected if current variable slaughter costs and transportation costs increased 50 percent above 1980 levels. However, additional research has shown that Corn Belt states such as Iowa and Illinois, which are large surplus producers of feed grains, would enjoy the greatest increase in competitive advantages in both cattle feeding and cattle slaughter if transportation costs increased sharply (75 to 100 percent) relative to other input costs (Clary, Dietrich, and Farris, 1984a). Under such a scenario, competitive advantages due to economies of size, currently enjoyed by such regions as West Texas-West Oklahoma, would be partially offset by the increased costs of shipping in bulky fed items from surplus feed grain regions.

Summary and Conclusions

The cattle feeding/fed-beef economy faces a rapidly changing economic environment over the next decade. As a consequence, firms hoping to succeed in this highly competitive industry must continually analyze their decision-making processes. Economic, technological, and social considerations will likely encourage changes in the optimum location, size, and management of cattle feeding and slaughter firms. These changes will impact upon optimum distribution patterns for feed grain, feeder cattle, fed slaughter cattle, and fed-beef. The objective of this study is to help the

industry anticipate the impact of some of these changes; specifically, those that relate to changes in regional feed grain supplies and to increases in slaughter and transportation costs.

Results indicate that estimated changes in regional feed grain supplies likely would have little impact on those regions with strong competitive advantages in feeding and slaughter, such as West Texas-West Oklahoma and Kansas. Furthermore, feeding and slaughter likely would shift from the more marginally competitive regions, such as the eastern Corn Belt, to the western Corn Belt and Central Plains, which possess significant locational and cost advantages in addition to excess feeding and slaughter capacity.

Regions with relatively higher regional slaughter costs--such as the Western Corn Belt, the Lake states, and the West Coast--would be adversely affected if such regional cost differences persist. However, when regional transportation costs are assumed to increase 50 percent or more, cattle feeding and slaughter would tend to become more production oriented. That is, in the absence of advances in transportation technology, increasing numbers of cattle would likely be fed in the primary areas of feed grain production. An alternative for cattle feeders in deficit feed grain regions under conditions of highly escalating transportation costs would be to place cattle on feed at heavier weights. Even though current fed cattle slaughter is becoming predominantly production oriented, relative increases in transportation costs, compared with other costs, would tend to accelerate this trend to production oriented slaughter.

In summary, consumers in deficit fed-beef producing regions will be supplied by those regions with a competitive advantage in the production and processing of fed-beef. The western United States will purchase fed-beef primarily from western, northwestern, and southwestern packers. Large, densely populated eastern fed-beef markets will be supplied by midwestern and Corn Belt packers. The South will look to packers from the Southern and Central Plains

to supplement limited southern fed-beef slaughter. The Southern Plains likely will remain the only region with a locational advantage in cattle feeding, in cattle slaughter, and in shipping fed-beef both to the East and West. However, increased competition is likely, especially from feedlots in the Central Plains and slaughter plants in the Central Plains and the western Corn Belt. If the Southern Plains is to remain the foremost cattle feeding and slaughter region, it must maintain a level of efficiency at least equal to such competitors as Kansas, Nebraska, Colorado, and Iowa.

Endnotes

- [1] The fed-beef system included shipments of feeder calves to feedlots, cattle feeding operations, and shipments of dressed fed-beef in carcass form to designated consumption points.
- [2] Regions were referred to throughout the study as Central Plains (Colorado, Kansas, Nebraska), Southern Plains (Texas, Oklahoma, New Mexico), Corn Belt (Iowa, Missouri, Illinois, Indiana, Ohio), and Western (Arizona, California, Washington).
- [3] Regional estimates were based on data concerning potential water availabilities (High Plains Associates, 1982) and deregulation of natural gas prices (Collins et al., 1982).
- [4] The study assumes that the cattle feeding industry is a residual user of feed grain supplies.

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