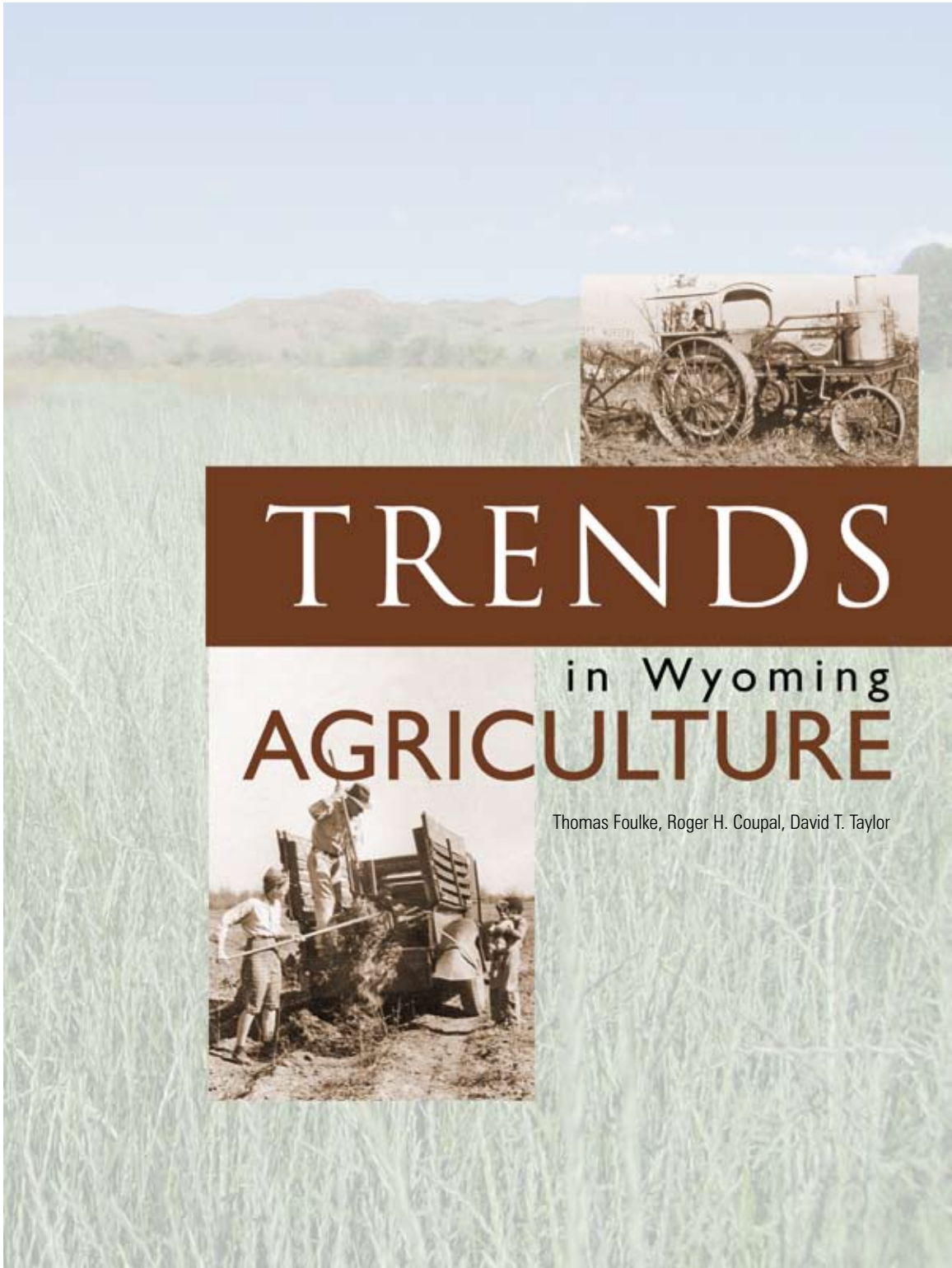




TRENDS

in Wyoming

AGRICULTURE

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Introduction

The University of Wyoming Cooperative Extension Service published the first edition of the Trends in Wyoming Agriculture series of publications in 2000 as a set of baseline bulletins, using the 1997 Census of Agriculture and other information to give readers a sense of where Wyoming's agricultural sector stands at the start of the new millennium. The series consisted of five bulletins covering topics such as demographics of operators, income, size of operation, employment and, the catch-all, level of production. Another of the authors' goals was to look back at Wyoming in the twentieth century to give readers an historical sense of where we have come from so we can better understand the changes to come. The bulletins were designed to be grounded

in the quantitative data of published statistics, but tried, and add some historical perspective as to how and why these numbers have changed over time.

This update of the series primarily uses information from the 2002 Census of Agriculture released in June 2004. Structural changes in the industry due to emerging trends in demographics and enterprise structure mean that the information in separate bulletins is more closely linked than previously thought. In this revision they have been combined into a single publication. Some of the information was reorganized for what we hope is a more logical, readable format.

Wyoming Agricultural Operators (1959-2002)

The structure of Wyoming agriculture is changing. This change is prominently reflected in the demographics of Wyoming's agricultural operators, and its effects have important ramifications for the future of agriculture and the economic structure of the state. The authors investigated this aspect of change through the United States Department of Agriculture (USDA) Census of Agriculture, which is conducted every five years. The most current year is 2002.

Demographics is the study of vital statistics including population, births, deaths, and marriages. Many factors in our society affect demographics. Health, medical care, income, government policy, job availability, political and cultural factors all come into play. This chapter examines age groups within the population of Wyoming agricultural operators to highlight certain trends.

Trends can be considered structural or cyclical in nature. Structural trends are changes in how the sector operates and are important to understand because of their long-term impact on the economy. Cyclical trends have a recurring nature and can be foreseen and planned for to mitigate their impact. Most likely, the trends identified in this bulletin have components that are both structural and cyclical.

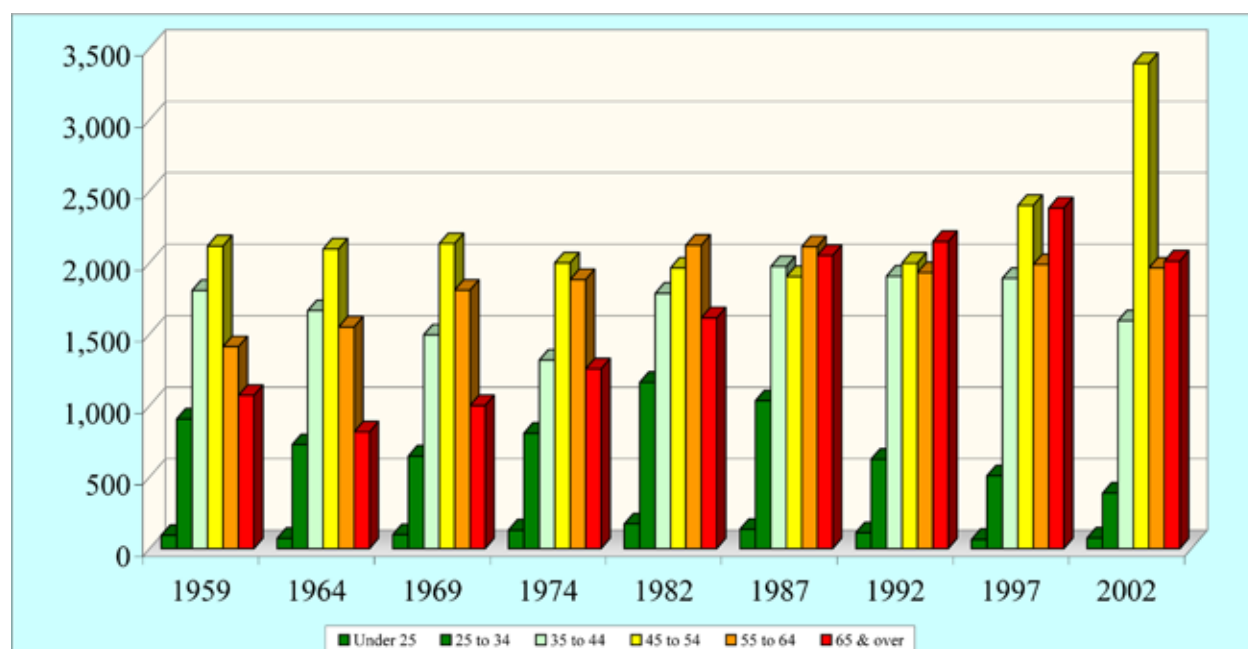
The number of agricultural operators in Wyoming has been slowly growing from 1959 to 2002. There were 7,406 agricultural operators in Wyoming in 1959, rising to 9,422 by 2002, an increase of 27

percent. According to the Census of Agriculture's current definition, a "farm" is any place from which \$1,000 [of agricultural products] or more were produced and sold, or normally would have been produced or sold, during the census. The Census does not distinguish between farms and ranches. The number of operators refers to all operators without regard to the size of the operation. The number of operators in each category was divided by the total for that year to obtain a percent share for category. A standardized percent share can be compared with other censuses across the years. This method accounts for changes in the number of operators between censuses.

Age Groups

Figure 1 shows the number of agricultural operators in Wyoming in each age group category (called "cohorts" by demographers). Much information is presented here, but the important thing to note is the bell shape for the early years in the series (1959, 1964, and 1969). Young and old are balanced around middle age, creating the relatively normal shape of the distribution. There are fewer operators in the younger categories; most are in their middle working years. As mortality and retirement take their toll, there are fewer older operators. Demographic changes were occurring by 1964, as the number of 55 to 64-year-olds increased. In 1974, the number of 35- to 44-year-old operators roughly equaled those in the 65- and-over cohort. The bell shape became more skewed toward the right as the older age groups gained numbers until 1997.

Figure 1. Wyoming agricultural operators (1959-2002) by age category.



(Source: USDA Census of Agriculture, 2002)

The 2002 Census of Agriculture appears to be a departure from this trend as some of the structural aspects of change appear to be overpowering or at least acting in concert with cyclical aspects. The most notable aspect is the dramatic increase in the 45- to 54-year-old age group. The possible reasons for this and other phenomenon are the heart of this section.

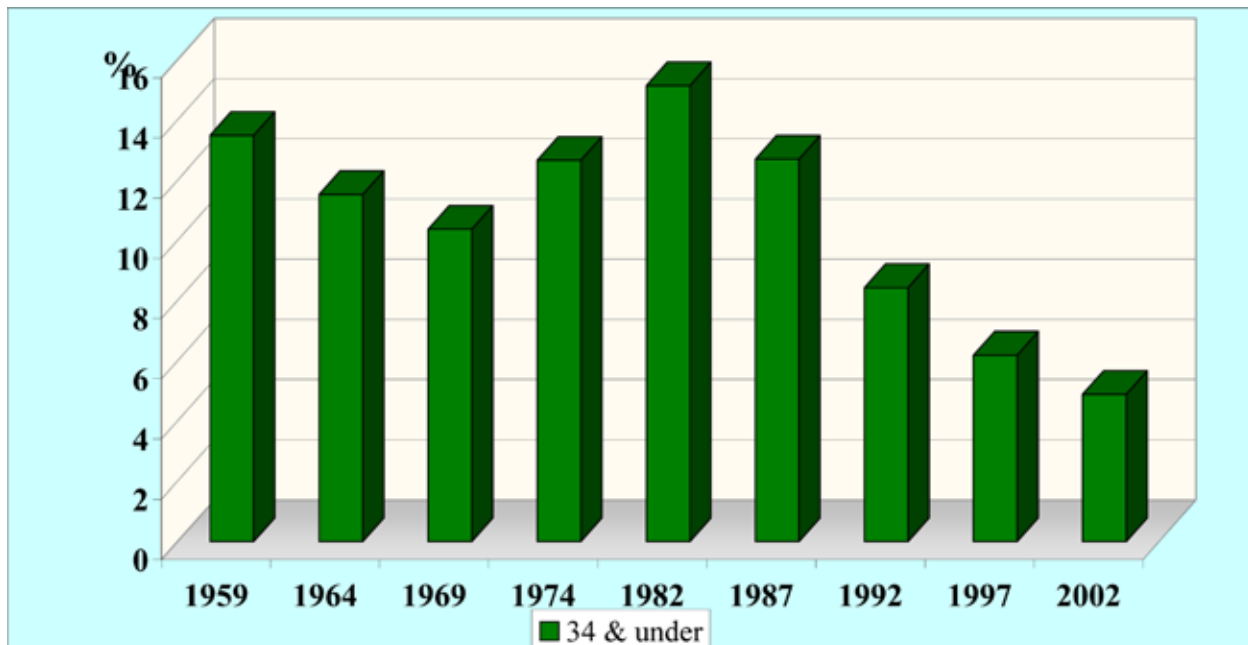
Figure 2 shows only those operators under 35 years old. This is the entry-level age group for agricultural operators and, in 1959, this category made up 13.5 percent of the operators. The graph shows the share of younger operators shrank to 4.8 percent by 2002, a 64.3 percent decrease. The change has been most pronounced since 1982 and shows continuous decline. This chart features evidence of both structural and cyclical changes. The structural component is the decline in overall share for the population cohort over time. The regular rise and fall in number signals the cyclical component in the population. A slight increase in younger operators coming into the industry based retirements/mortal-

ity in the early 1980s could potentially also reflect the initial phase of baby boom generation operators taking over.

The “35 to 44” age cohort has remained fairly steady as people tend to be more settled in a profession at this age (Figure 3). Still, there was a 31 percent decrease in this age group over the period that was probably influenced by general aging in the population. Aging is considered to be a cyclical event, yet it is not as pronounced in this graph. The dip in the year 1974 is considered to be cyclical in nature.

The “45 to 54” cohort shows an unprecedented increase (Figure 4). This group represented 28.6 percent in 1959, and grew to 35.9 percent by 2002, a 26 percent increase. The increase could be evidence of structural change. The dips in 1959 and 1987 could have cyclical implications from inter-generational transfer of ownership, but the dramatic increase in 2002 is likely the result of structural changes discussed later in this report.

Figure 2. Wyoming agricultural operators (1959-2002) aged 34 and under.



(Source: USDA Census of Agriculture, 2002)

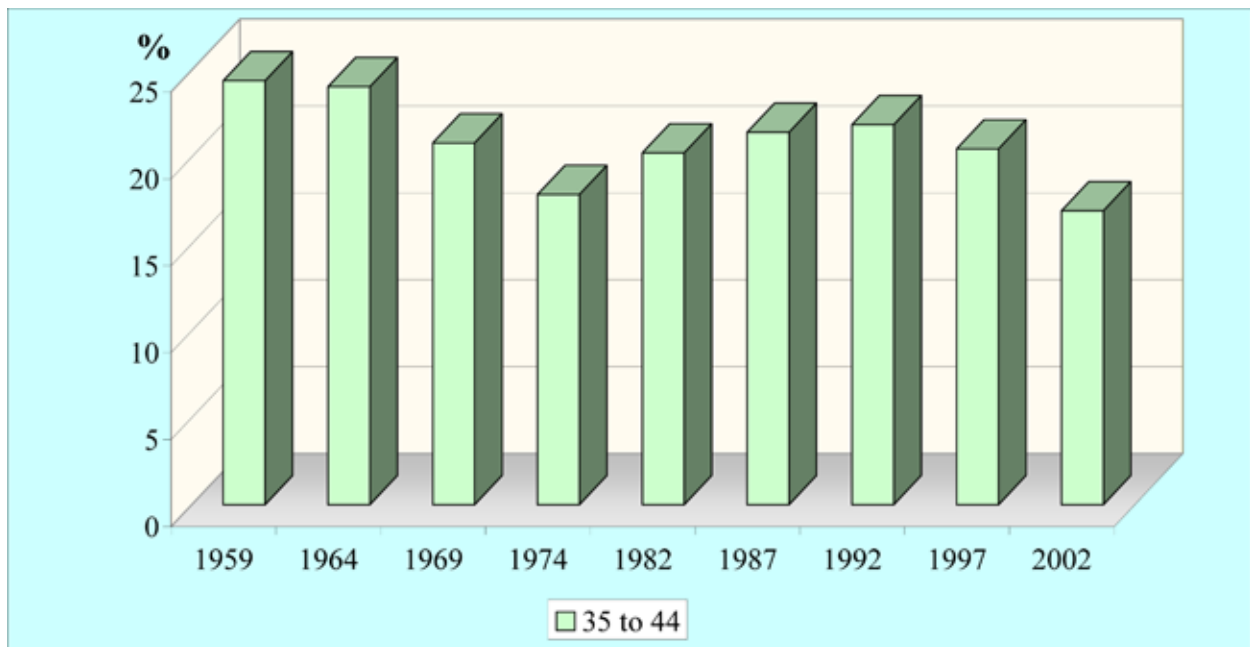
Structural vs. cyclical trends

The difference between structural and cyclical changes can be subtle for their common denominator is that both types of change can have profound effects on the industry. For purposes of this publication, cyclical changes are considered to be recurring or fluctuating changes. Some examples include: the cattle cycle, seasonal changes in crop and livestock prices and the apparent ups and downs in the number of operators due to aging in the population.

Structural changes are more permanent in nature. They include industry-wide shifts in employment levels based on the use of new technologies or market-based shifts due to changes in tastes and preferences, and the number of operators who choose to exit or enter the industry.

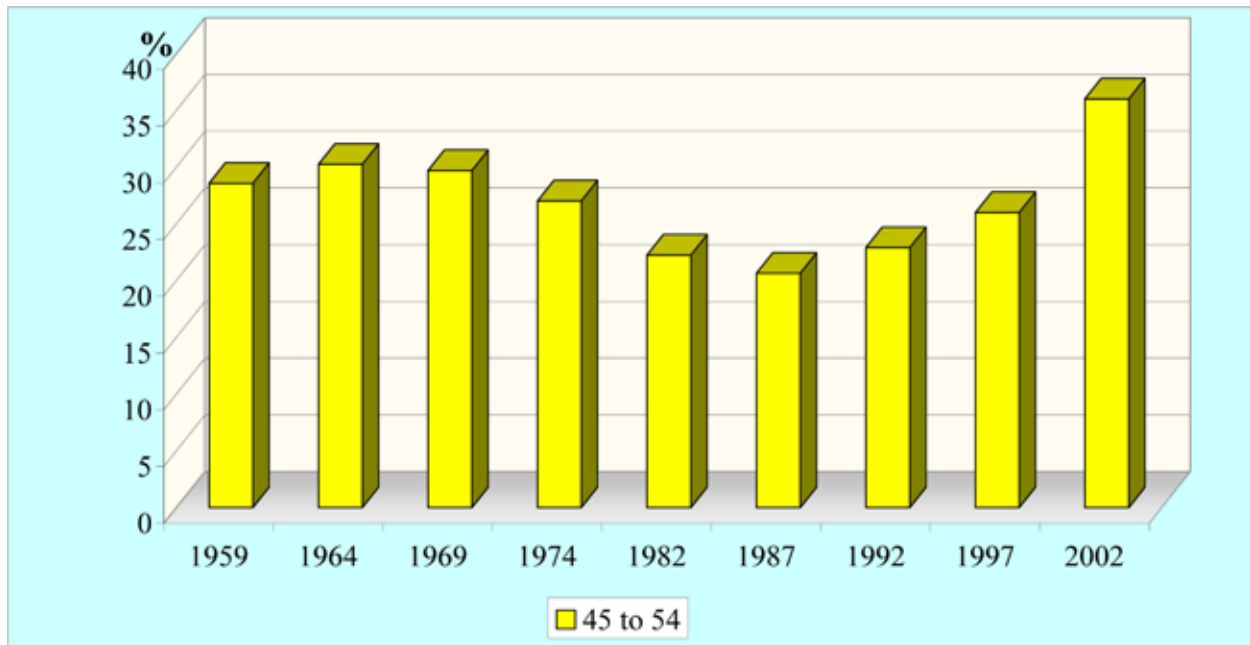
Trends are the result of changes over time in the numbers that form a discernable pattern. For example, the general decline in the number of younger operators could be considered a trend. There is no hard and fast rule as to when change in general becomes a trend.

Figure 3. Wyoming agricultural operators (1959-2002) age 35 to 44.



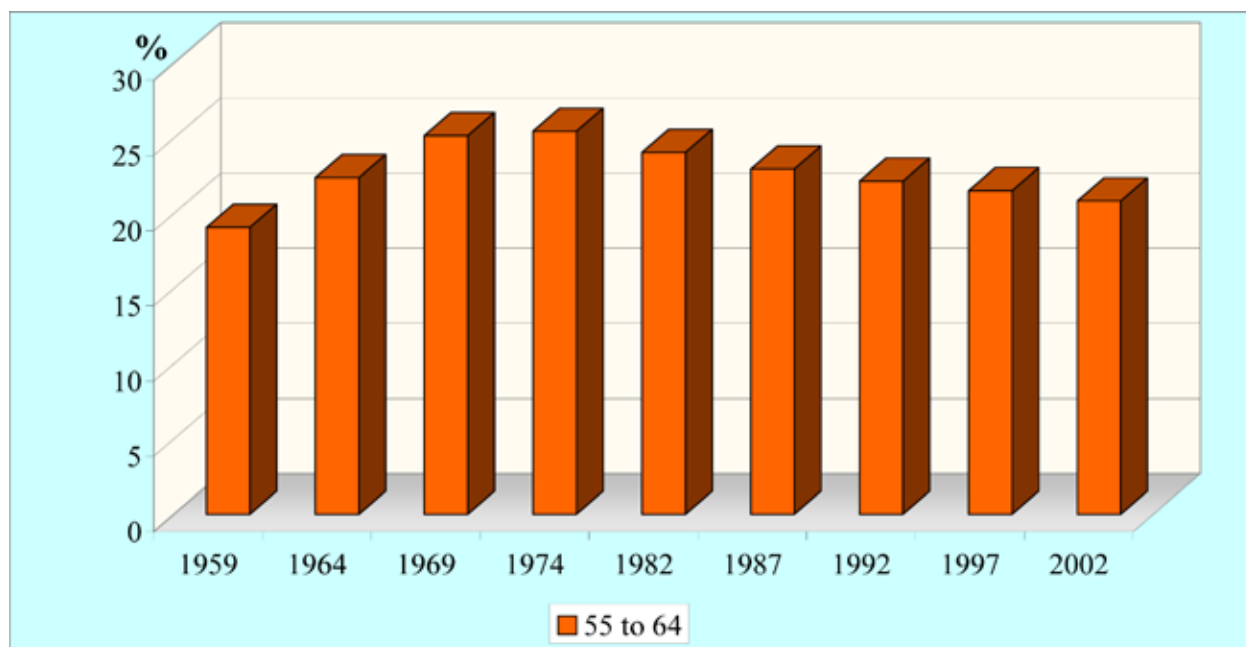
(Source: USDA Census of Agriculture, 2002)

Figure 4. Wyoming agricultural operators (1959-2002) age 45 to 54.



(Source: USDA Census of Agriculture, 2002)

Figure 5. Wyoming agricultural operators (1959-2002) age 55 to 64.



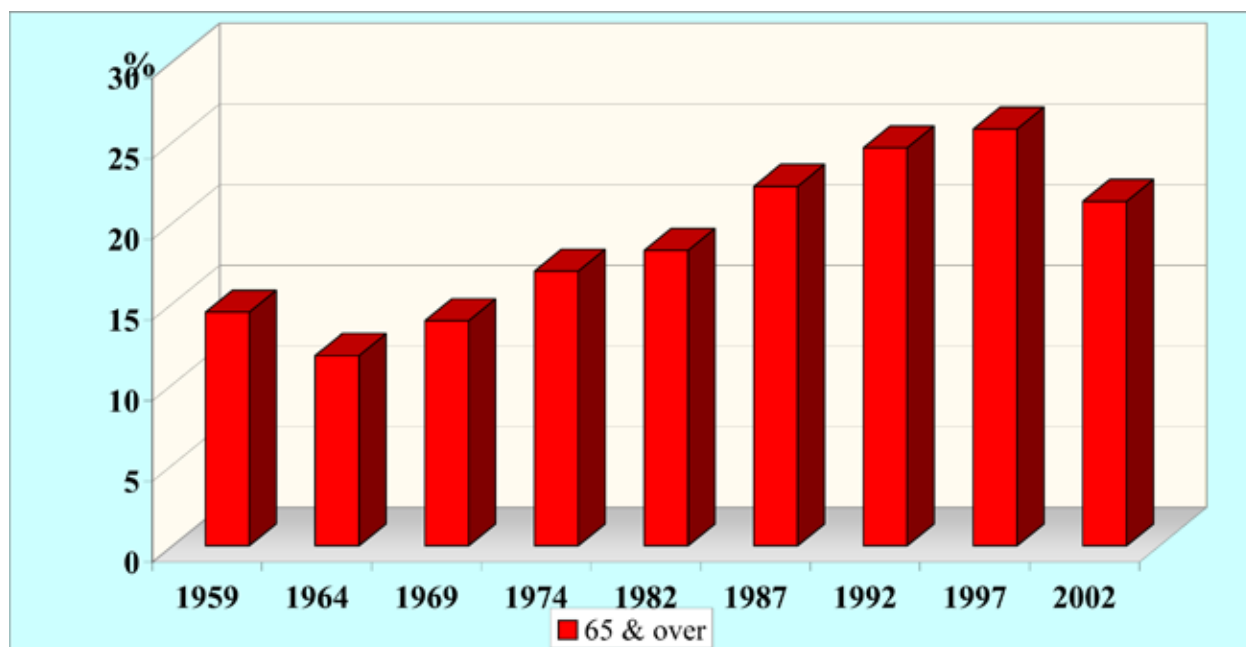
(Source: USDA Census of Agriculture, 2002)

The “55 to 64” cohort has increased 9.3 percent (Figure 5). This represents a change from a 19 percent share in 1959 to a 21 percent share in 2002. The peak year for this category was 1974 when the group accounted for 25.5 percent of the operators. The slow decline since that time could be attributed to the cyclical nature of demographics. The population cohort younger than this (45 to 54 years) has shown an increase in recent years. As this group ages, it will move into the 55 to 64 range, validating the view that cyclical forces are the primary forces acting upon the age group. If the number of operators in the 55- to 64-age group continues to decline, then it becomes apparent that structural forces are working on the population, creating changes beyond simple aging.

The “65-and over” cohort has undergone dramatic change over the past 40 years (Figure 6). It represented just 14.5 percent of the operators in 1959 and by 1997 accounted for 25.8 percent, a

78.5 percent increase. Information from the 2002 Census of Agriculture shows that this category has reversed from the previous upward trend. The authors believe that the significant departure from the previous trend is due to both cyclical and structural factors. From a cyclical perspective, the number of operators over 70 years of age declined more than 15 percent between 1997 and 2002. This might also help to partially explain the rise in the number of operators in the 45- to 54-year-old range — they are the inheritors or successors for retired operators. But the decrease in the number of 65 and older operators does not nearly account for the increase in the number of 45- to 54-year-olds. For this, the authors speculate a structural cause. As we shall see later in this publication, the number of smaller operations (under 100 acres) has grown significantly. The evidence appears to lead to a growth in operators of this cohort (45 to 54 years) on smaller operations.

Figure 6. Wyoming agricultural operators (1959-2002) age 65 and over.



(Source: USDA Census of Agriculture, 2002)

Trends and Dynamics

The statistics presented so far lead to some intriguing observations. It appears there are several trends occurring on both the structural and cyclical levels that are interacting to create the pattern of operator demographics observed. In general, the population is living longer, healthier lives as medical care improves. Technology (mechanization) has allowed operators to be more productive longer. This means the next generation is coming into its inheritance later in life, which may help to account for the 64 percent decrease in those operators “Under 35” since 1959. This trend also suggests that as the population of operators ages, they are controlling farms and ranches longer. Their children may not become managers until later in life. As intergenerational transfer approaches, the younger generation may have been away from agriculture long enough to make the transition harder and, in some cases, less likely and less successful. It appears that medical care and mechanization are shifting the natural cycle of entrants and exits to the right — operators are older when they enter the industry and older

when they exit. The data shows that the right-shift in age identified in our earlier publication (Foulke et al, Age, 2000) may have come to an end, and that a moderating in average age of operator, albeit at an older age, is occurring.

The end of the right shift in the distribution of operator demographics is only part of the demographic story, for the number of operators gained by the 45- to 54-year-old cohort exceeds the number of operators lost out of the 65 and over cohort. Intergenerational transfer (succession) appears to account for only part of the increase. Something else is happening. The number of agricultural operators remained almost the same (9,442 in 1997 versus 9,422 in 2002) between the two latest censuses even though most of the size categories declined. The notable exceptions were those operations under 100 acres and those over 5,000 acres in size. In Wyoming, operations under 100 acres in size are generally too small to provide enough income for a living wage. These part-time agriculturalist are often semi-retired or those seeking to benefit from rural living as opposed to those who engage in

agriculture as a primary means of a livelihood. The authors refer to these smaller operations as “lifestyle enterprises” since they are more likely to be part of rural residential subdivisions closer to larger towns where operators can find full-time employment and to more urban amenities such as entertainment and medical care.

Very large operations (over 5,000 acres) make up a small percentage of the operations (15 percent) but account for more than 80 percent of the land in agriculture. Since there are fewer large operators, most of the new operators must be going to the smaller operations which are less economically viable. Increasing numbers of smaller lifestyle operations and smaller numbers of larger commercial operations points to a structural shift in Wyoming agriculture away from more medium-sized operations.

The future of agriculture appears more industrialized. The meatpacking industry is an example where consolidation and concentration are producing “changes in livestock marketing with a shift away from spot markets to direct contracting between livestock growers and processors...” (USDA, ERS, 1999). If this prognosis is correct, then those structural shifts will trickle down vertically through the sector forcing changes in production practices. Additional impacts will be seen in the rest of the economy as agricultural services, government, and local communities adjust. These structural changes could very well have cyclical implications if there is significant impact on the structure of enterprises, particularly in regard to succession in family enterprises. The 2002 Census of Agriculture may be showing the beginnings of this type of shift.



Size of Operation (1935-2002)

From Wyoming's earliest days as a territory, the amount of land in a holding has determined economic viability and this, in turn, influenced the income potential and social status of the agricultural operator. This chapter discusses trends in the size of Wyoming agricultural operations and the continuing impact of size on the structure of the sector.

Nineteen thirty-five was chosen as the baseline year because it is the first year that acreage categories are readily comparable to today's census. Additionally, the Taylor Grazing Act closed the West to homesteading in 1934, allowing analysis of a more stable land base. Analysis of earlier years would be more difficult due to the necessity of re-categorizing data. Information from earlier periods is cited from the 1920 census.

Information from the census table Land in Farms was used in this analysis. It should be noted that the census does not distinguish between farms and ranches even though in Wyoming ranches are more common. Therefore, the words "farm" and "ranch" are used interchangeably to denote agricultural enterprises in Wyoming.

Historical Considerations

To understand the significance of size in agricultural operations, it is important to take into account some historical considerations in the development of the state's agricultural base. The following brief overview is not meant to be all inclusive of Wyoming's rich legacy of ranching and farming but

merely to frame the information in an historical context.

Wyoming agriculture has been centered on livestock from its beginnings — first cattle, then sheep, and then cattle again. Cattle from Texas were driven through the territory as early as 1866, although they had passed through the territory even earlier along the Oregon Trail. By 1870, cattle were streaming north on the Texas Trail. Wyoming was home to the "open range" concept that allowed all newcomers to graze. Because there was little competition, open range grazing was not a problem in the early days. In 1860, barbed wire was invented in France, and the first U.S. patent was issued in 1868; however, barbed wire was not available in large quantities until the mid-1870s. Without fences, cattle were turned out on the range together, separated by brand at roundup and shipped by rail to markets in the east. This type of arrangement also lent itself to investment and eventually consolidation into larger holdings. It is interesting to note that, in the early days, there was considerable European investment in Wyoming ranching. The Laramie County Stock Growers Association was formed in 1873 and renamed the Wyoming Stock Growers Association in 1879. This organization became a force not only in the industry but in political circles. Cattle remained dominant until the severe winter losses of the late 1880s forced retrenchment in the industry (Linford, 1947).

Table 1. Wyoming cattle and sheep inventory, 1870-1920.

	1870	1880	1890	1900	1910	1920
Sheep	6,409	450,225	712,520	5,099,613	5,397,161	1,859,775
Cattle	11,130	521,213	934,066	687,284	767,427	875,433

Source: Fourteenth Census of the United States, 1920

Sheep came to prominence in the 1890s (Table 1) as they offered two products, wool and lamb, and had the ability to graze more arid lands. Yet the introduction of sheep fueled contention for the state's scarce resources (grass and water) that were already overburdened by growing numbers of livestock.

More and more homesteaders were moving into Wyoming during this time, forcing confrontation with the cattlemen. Whereas a "cattle baron" might own only a 160-acre homestead, his herds would graze thousands of acres of open range. Homesteading settlers increasingly staked out prime grass and water locations limiting access to the larger herds. The defining point came during the 1892 Johnson County War when cattlemen tried (and failed) to remove the homesteaders with a force of regulators. After this episode, changes in the industry were inevitable as the days of the open range were numbered.

Commercial farming was not commonplace in nineteenth century Wyoming. Oats were the largest crop in 1899 with 26,892 acres, followed by wheat with 19,416 acres (Commerce, 1920). Most people considered Wyoming's semi-arid climate too dry for farming without irrigation, which was slow to develop. But new technologies and political movements in the first decade of the twentieth century changed that. An independent researcher by the name of Hardy Webster Campbell published the Soil Culture Manual in 1902 in which he expounded on his research in dry land farming. In addition to his research, he was a good propagandist, and newspapers everywhere began extolling the virtues of dry land farming (Layton, 1988).

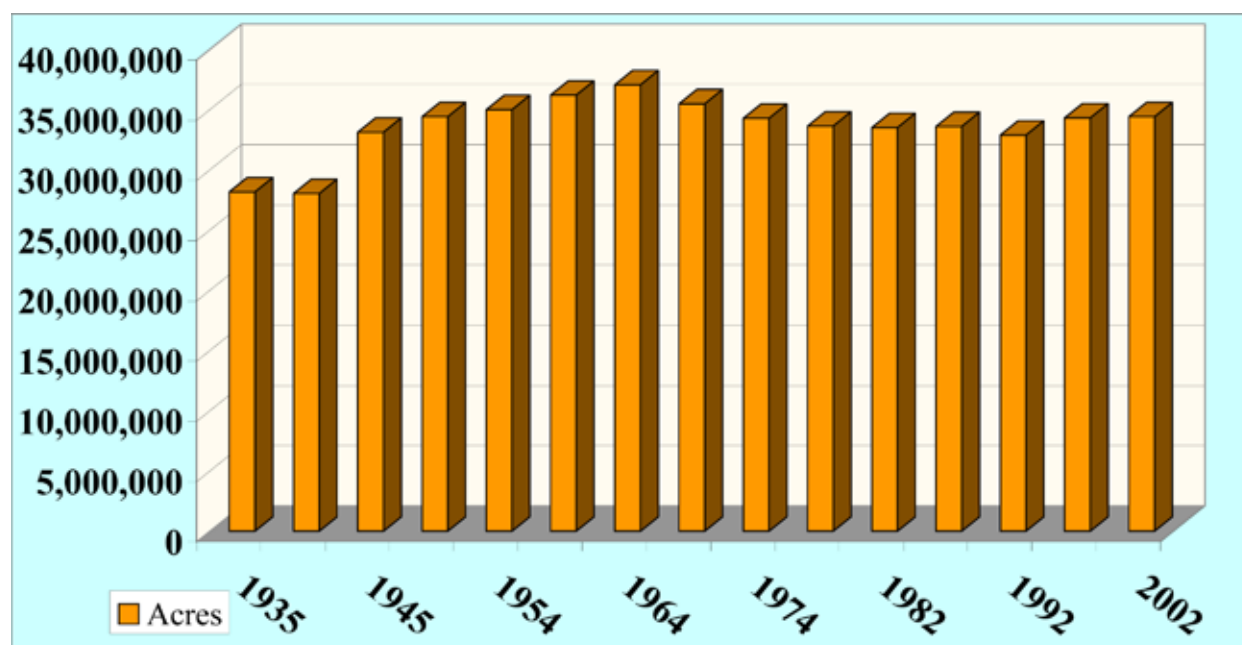
In the early twentieth century, America was experiencing the pangs of a newly industrialized nation. People were leaving the countryside and heading

to cities in search of a better life. The "Country-Life Movement" grew in response "not only to improve farming, but also to improve the quality of farm life" (Layton, 1988). A chief proponent of this movement was President Theodore Roosevelt. Roosevelt said, "No nation has ever achieved permanent greatness unless this greatness was based on the well-being of the great farmer class, the men who live on the soil; for it is upon their welfare, material, and moral that the welfare of the rest of the nation ultimately exists" (Layton, 1988).

Momentum built around the country and culminated in the Enlarged Homestead Act of 1909. The act was a dry land farming homestead act for nonirrigable, nonmineral lands in the western states. The signature parts of this act were to increase the size of a homestead from 160 to 320 acres and to decrease the residency requirement from five years to three (Layton, 1988). The Transmissouri Dry Farming Congress was holding its third annual convention in Cheyenne shortly after the act was passed. President Roosevelt sent a letter to the congress stating, "Any organization having for its purpose the development of the agricultural resources of the great semi-arid section of the United States should have the hearty support of all good citizens" (Layton, 1988). One result of the act was a 38 percent increase in total farm acreage in Wyoming between 1910 and 1920 (Commerce, 1920).

Law and policy changes continued to affect the still-growing sector through the 1920s. The Stock Raising Homestead Act of 1916 further enlarged the size of a homestead to 640 acres of nonirrigable land. Among the supporters of this act was Wyoming rancher and Congressman Frank W. Mondell. The act had the well-meaning design of attempting to open more public lands to settlement and economic development, but the reality was much

Figure 7. Wyoming land in farms, 1935-2002.



(Source: USDA Census of Agriculture, 2002)

harsher. A section (640 acres) was still not enough to provide for a living. Depressed grain prices and drought following World War I limited the effectiveness of the act (Layton, 1988).

In 1930, there were still 15,929,460 acres of “vacant, unappropriated, and unreserved” public land in Wyoming (Layton, 1988). But economic and political realities of the day were changing. The Taylor Grazing Act of 1934 superseded the homestead acts, closing public lands to homesteading. The days of free land in the American West were over. A few irrigation projects were ongoing for some time, so land was still being added to the agricultural base. What the droughts in the 1920s and the Depression of the 1930s started, the Taylor Grazing Act completed, ending the rush to dry land farming. Today, dry land farming continues in areas of the state where the climate and current practices allow, but on a more sustainable level.

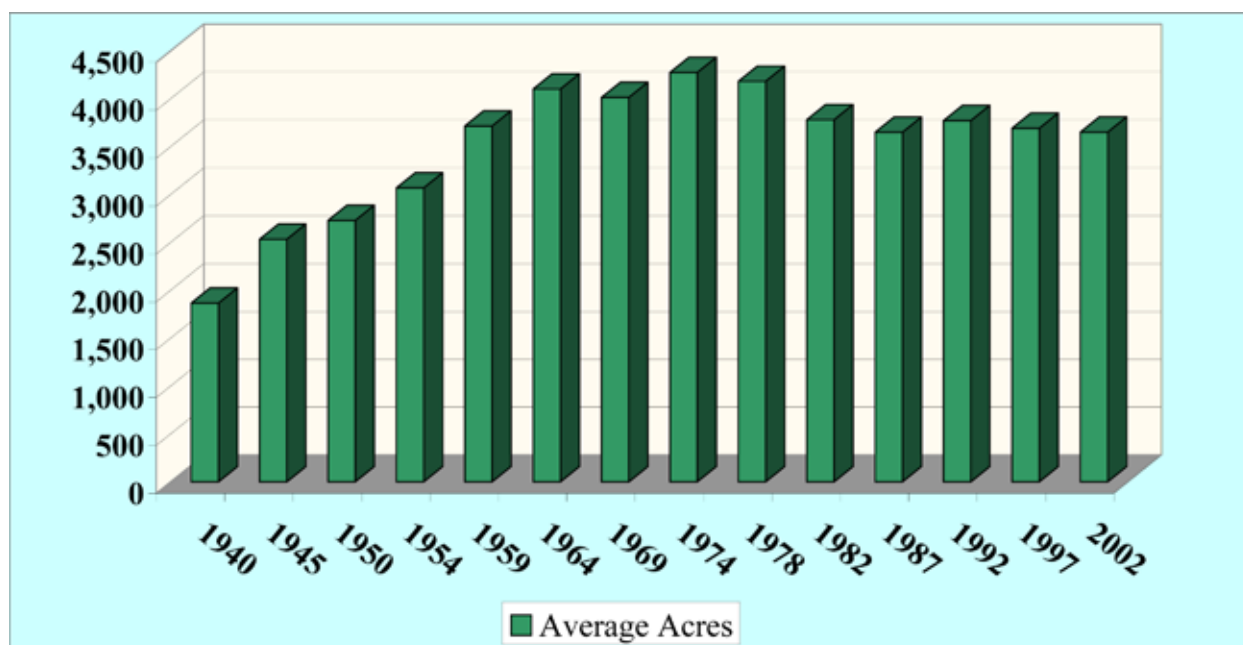
Although livestock always have been dominant over crops in Wyoming, the events of the 1920s and 1930s pushed producers even more toward livestock by closing the range to further settlement. Sheep and cattle producers coexisted (somewhat peaceably) on the range that became more and

more firmly under federal control during the 1930s and 1940s. The shift from cattle to sheep that had occurred after the harsh winters of the late 1880s reversed itself in the second decade of the twentieth century. By 1920, the value of cattle was twice that of sheep in Wyoming (Commerce, 1920). Cattle continued to gain dominance even though sheep numbers grew until the mid-1940s. The advent of synthetic fibers, changing tastes and preferences, and increased foreign competition have contributed to declining sheep numbers since.

Land in Farms

Figure 7 shows the later stage of Wyoming’s agricultural land development after the Taylor Grazing Act. The peak year for agricultural land was 1964 with 37,052,797 acres. This number was reduced to 32,876,071 acres by 1992. The most current census lists 34,402,726 acres. The increase may largely be due to differences in statistical methods. The Bureau of the Census conducted the Census of Agriculture until 1992. Starting in 1997, the Department of Agriculture has taken over responsibilities for this function. The new methodology counts CRP (Conservation Reserve Program) land, which totaled 255,741 acres in 2002.

Figure 8. Average farm size, 1935-2002.



(Source: USDA Census of Agriculture, 2002)

Average Size

With the range closed and the amount of available land no longer expanding, consolidation was the only answer for operators wishing to increase acreage. Figure 8 shows average farm size from 1935 to 2002. The average size of operation increased 129.3 percent from 1935 to 1974, largely due to the revolution in mechanization that allowed greater productivity. Producers consolidated holdings of smaller less profitable farms left over from the homestead era. Average farm size peaked in 1974, the beginning of a period of profound change in agriculture. Inflation and macroeconomic forces started to work against operators and put a halt to expansion efforts (see chapter 3). In addition, the rise in the number of smaller lifestyle operations since 1974 tips the averages in favor of smaller operators for statistical purposes.

Conversely, the number of farms (or ranches) in Wyoming steadily declined from 1935 to 1974 as the size of operations grew on a fixed land base (Figure 9). There were 16,616 farms in 1935 with an average size of 1,610 acres. Thirty-nine years later, in 1974, there were only 8,018 farms with

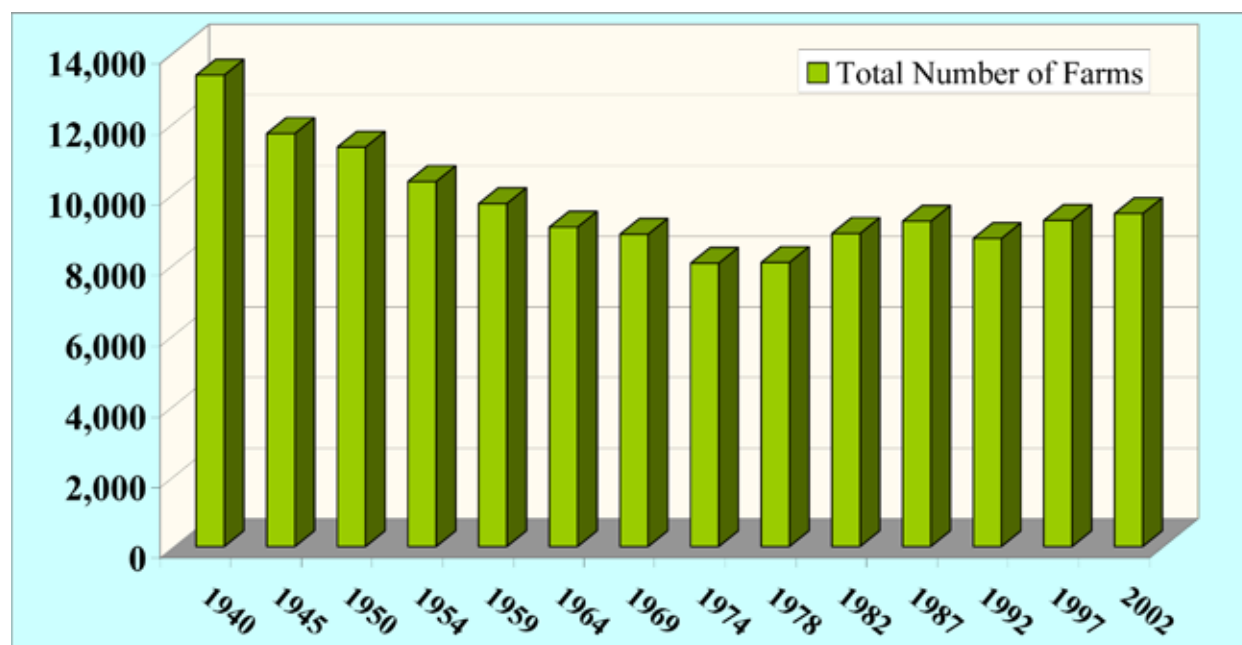
an average size of 4,274 acres. Note in Figures 8 and 9 that the pivotal year is 1974 when number of farms is smallest and average size is largest. The size and number of farms has been relatively stable and rebounded only slightly since 1974. The 2002 census reports 9,422 farms with an average size of 3,651 acres.

Size of Wyoming Agricultural Operations Today

There are two yardsticks generally used to measure the size of operations: market value of products sold, and acreage. Economists like to use market value of products sold since land productivity varies; however, due to inflation, cyclical variation in some agricultural prices and, more importantly, the type of data available for study, acreage lends itself more to the type of time series analysis done here. Acreage will be used here as a yardstick for looking at older data to show how the size of farms has changed in area, but the market value of products sold will be introduced to discuss current trends.

The short history in the previous section illustrates how the agricultural sector in Wyoming evolved,

Figure 9. Wyoming, total farms, 1935-2002.



(Source: USDA Census of Agriculture, 2002)

lending insight into the current structure. A critical aspect is the large and small holdings disposition. Figure 10 shows the number of Wyoming agricultural operations based on acreage. Note the growth in 2002 in the number of operations in the 10- to 49-acre and the 50- to 179-acre categories. The number of operations in the 5,000-acre-plus category reversed direction in 2002. This drop in numbers belies the fact that large operations continue to get larger. Ranches in the 5,000-plus-acre category grew in average size by about 720 acres between 1997 and 2002 even as the number of them declined (1,386 in 2002 versus 1,437 in 1997). The percentage of agricultural land in these very large operations increased by 1 percent to 82 percent in the last four years. This one percent represents about 521,000 acres.

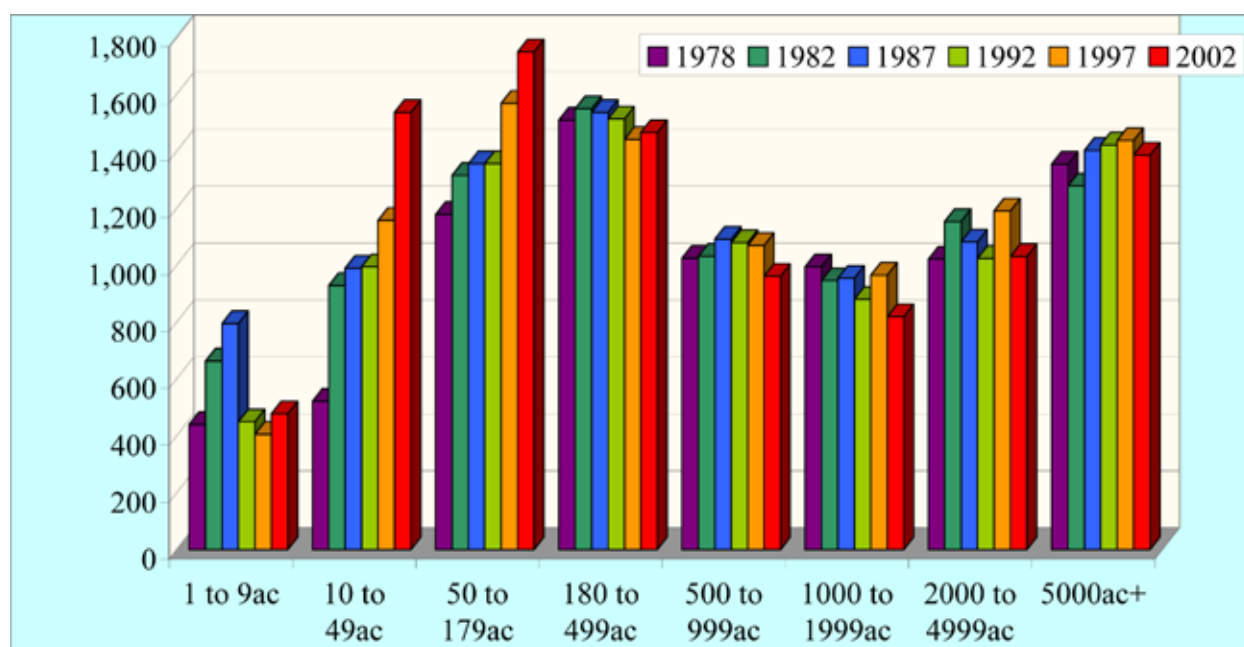
Looking at Figure 10, one can pick out two peaks in the graph. There are concentrations at either end of the spectrum. By grouping together the 10- to 49-acre category and the 50-to 179-acre category, one can see there had been tremendous growth in the number of these smaller operations. Statistically, data that shows this type distribution is called a bimodal distribution because there are two domi-

nant categories or modes in the population (the two smaller categories being lumped together).

The bimodal phenomenon is not new to Wyoming. Historical data reveals the number of larger and smaller operators grew at rates that were roughly similar to those of the land base. The census categories have changed over the years, making it more difficult to show just how many and what size the larger operators are. All operations over 1,000 acres were reported in one category until 1959 (even though average size reported in 1935 was 1,610 acres). The largest category from 1959 to 1978 was 2,000 acres plus. Currently, all operations of 5,000 acres or more are lumped together. The largest category in 1935 (1,000 plus acres) accounted for 84.1 percent of the land ownership. This same category accounted for 95.9 percent of the land ownership in 1997. Today, the 5,000-acre plus category accounts for 82 percent of the agricultural land ownership in Wyoming.

Small producers significantly outnumber large producers. Homesteading laws ensured that each producer had at least 160 acres in the days of the open range. Later laws expanded that to 640 acres, but even this was too small to provide for a family

Figure 10. Number of farms in Wyoming by size.



(Source: USDA Census of Agriculture, 2002)

in the semi-arid West. With the closing of the range, larger producers were able to purchase more land to ensure their position in the market place. Smaller producers were forced to either grow or fail.

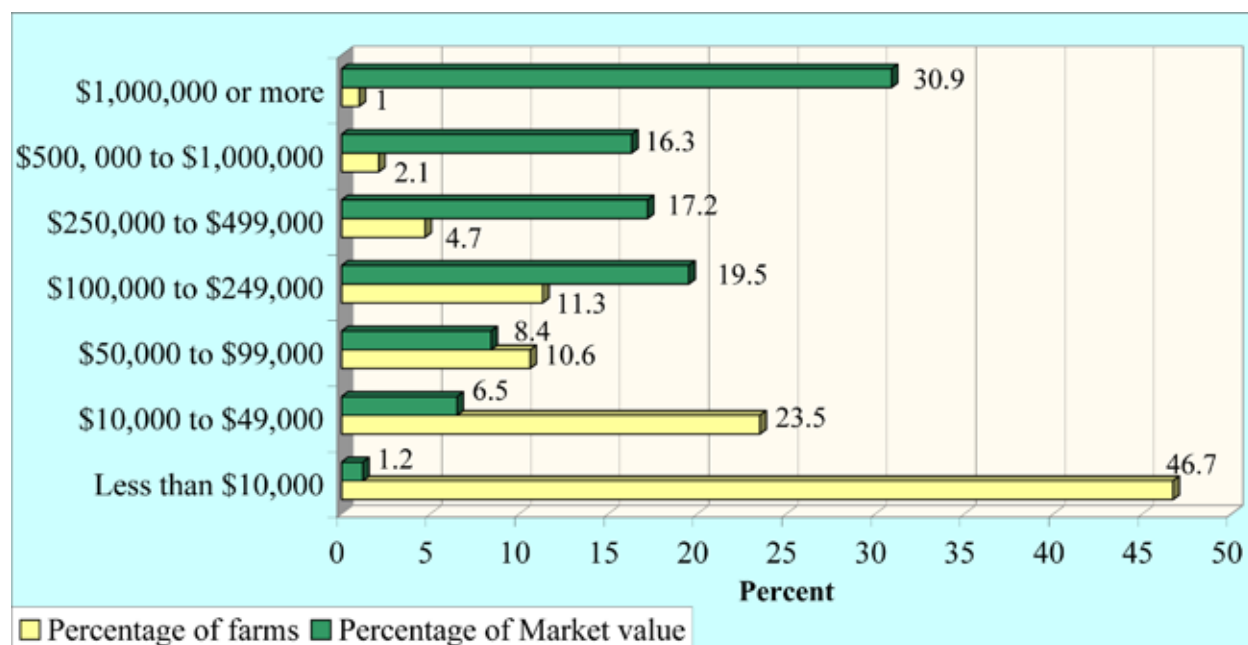
Another transformation has occurred with small producers. A smaller producer's livelihood was subsistence in the days of homesteading. Today's economy dictates that the smaller producer have off-farm income to supplement (or support) his or her agricultural earnings (USDA, 2004 Family Farm Report, 2005). The same sentiments that produced the Country Life Movement of the early twentieth century are working on people today. Many people desire the freedom and quality of life that agricultural living provides. Modern transportation and communications allow people to live farther from urban nodes and still have modern conveniences. It is now possible to pursue a rural lifestyle and an urban career. In many cases, the result is small holdings known as "ranchettes," "hobby farms," or what the authors call "lifestyle enterprises" subdivided out of larger parcels often within commuting distance of larger towns. Ranging in size from 1 to 200 acres, but often found in the 35- to 40-acre size, these holdings are represented in Figure 10 by

the first three clusters of columns. Note how the 10- to 49-acre and 50- to 179-acre categories made significant gains in the 2002 census, increasing 27.4 percent and 13.1 percent, respectively, from the previous census. These holdings still have at least \$1,000 in annual agricultural production — the minimum level the USDA considers a "farm" for statistical purposes.

Market Value of Agricultural Products Sold

From an economist's point of view, the market value of products sold measures more accurately than acreage the size of an agricultural operation. This is due to the varying productivity of land. Wyoming farms and ranches sold \$863,887,000 worth of livestock and crops in 2002 (Agricultural Statistics, 2003). Figure 11 shows the distribution of the value of products sold by the size of market value of those products and percentage of operations in those classes. An important aspect of this graph is that larger operations contribute the vast majority to the market value of production. The top 1 percent of producers produced 31 percent of the market value of production for the state.

Figure 11. Percent of farms and market value of agricultural products sold: 2002.



(Source: USDA Census of Agriculture, 2002)

The Census of Agriculture reports there were just 103 of these “farms” in 2002. Similarly, the largest 19.6 percent of the producers contributed 83.4 percent of market value of Wyoming’s agricultural production (i.e., all producers selling over \$100,000 in 2002). Conversely, smaller producers (under \$100,000) make up 80.8 percent of the producer population and contribute only 16.1 percent of the value of Wyoming’s agricultural production. The trend in market value of products sold in Wyoming agriculture is one of an increase in concentration toward larger operations. Even though the number of smaller operations has been increasing, their share of market value has decreased. Between 1997 and 2002, the share of market value of products sold for agricultural operations with sales of under \$50,000 dropped from 8.8 percent to 7.7 percent even though the number of firms in that category rose from 66.7 percent to 70.2 percent.

Trends Going Forward

Industrialization is the word frequently used with regard to the trends of consolidation and concentration in agriculture. This applies to both vertical (stages in the production process) and horizontal

(the size of each stage of production) aspects of the sector. Congress and the United States Department of Agriculture are concerned with these trends because they “have far-reaching impacts on farmers, agribusinesses, consumers and rural communities and they affect the ability of the United States to compete effectively in international markets” (USDA-ERS, Concentration, 1999). However, “the industrialization of agriculture, including the increasing use of contracts, is likely to continue to make inroads” (USDA-ERS, Concentration, 1999).

The meatpacking industry has been cited as an example of an area where consolidation and concentration are producing “changes in livestock marketing with a shift away from spot markets to direct contracting between livestock growers and processors...” (USDA-ERS, Concentration, 1999). If this prognosis is correct, then those structural shifts will trickle down vertically through the sector, forcing changes in production practices. “Industrialization may overwhelm existing environmental controls, create intense new stresses on local public services, undermine the incomes of producers using more traditional production methods, and change rural communities” (USDA-ERS, Concentration, 1999).

These trends also have important implications for both small and large producers:

Small producers are particularly concerned. Contractual arrangements used by larger buyers and sellers may limit market outlets for small independent producers, reducing their ability to compete. Another aspect is that trading on the open spot market may become more volatile when spot market prices are based on fewer trades. Finally, small producers may be subject to price discrimination if quality premiums in contractual arrangements are not made publicly available.

If large producers in concentrated markets are able to realize economies of scale, concentration may, in some cases, lead to lower production costs, greater input demand, and lower consumer prices. In those instances, concentration would create greater economic efficiency.

Industrialization and structural change sometimes limit competition. But their broader effects

more often reflect competition while undermining traditional methods of production, environmental control, and public service delivery. The challenge for policy makers is to identify which, if any, of industrialization's effects should be constrained and to design instruments that can reach those policy goals (USDA-ERS, Concentration, 1999).

What this means is that industrialization and structural change are forcing change in traditional agricultural production methods. These changes, which affect both large and small producers, have unknown impacts on the future of agriculture in Wyoming. Global economic trends are driving some of this change with regard to the larger operations which continue to need to be profitable to stay in business. Smaller operators on lifestyle enterprises with significant off-farm income are often not subject to the vagaries of the market to such a degree, but may require a certain amount of agricultural income to maintain their operations regardless of profit levels.

3 Agricultural Income and Employment (1969–2002)

Historically, agriculture has been one of the pillars of Wyoming's economy. The state's economic base was founded on agriculture and energy to which tourism was a later addition. Together, these three sectors form the basis of Wyoming's economy and are inseparably intertwined with its history and culture; however, the reality is that agriculture's share of the state's total economic activity has declined considerably. Not because agriculture itself is declining in the state, but because changes in the structure of the agricultural sector brought on by increased productivity as a result of mechanization have pushed other sectors, particularly minerals, ahead of agriculture.

The twentieth century was a period of rapid social and technological change affecting nearly every aspect of society, including agriculture. But to what degree has the structure of Wyoming agriculture been influenced, and what developing trends are important to producers and policy makers for the future? Agriculture currently supplies only 3.0 percent of the Gross State Product (GSP) and accounts for only 3.7 percent of total employment (BEA, 2004). Yet these numbers understate agriculture's important contributions not only to the state's economy but, more significantly, to its local communities. Agriculture is among the top five employers in 76 percent of Wyoming zip codes (Commerce, 1990). Agricultural operators are small businessmen and women whose operating needs run the gamut of local business and government offerings. The need for a broad variety of goods and

services helps make and keep communities viable and encourages stability and growth. In addition, 97 percent of all private land in Wyoming is agricultural, creating a significant repository for the state's open space resources. As Wyoming shifts toward a service-based economy, changes in the structure of agriculture, the economy, and local communities are bound to take place. This chapter explores the effects on agricultural income and employment and the trends which are taking shape.

Productivity Surge

Nationwide, agricultural employment has been declining since the 1930s (Commerce, 1954, 1997, USDA, 1997, 2002). The major reason for the decline is increased productivity due to technology. For example, the internal combustion engine has revolutionized the way farmers and ranchers have done business, allowing fewer workers to accomplish more work. The addition of newer and more efficient production methods has had a multiplying effect as the horsepower of machinery increased. Even seemingly small changes, such as the use of large round bales, have significantly decreased the need for labor on Wyoming farms and ranches. One or two people are now able to accomplish a whole hay crew's work with less time and at less cost.

Electrical appliances have had significant impact on agricultural practices — think of the labor reduction due to electric shears in the sheep industry. To illustrate the impact of mechanization in agriculture, Table 2 shows the number of trucks and tractors

Table 2. Tractors and trucks on Wyoming farms, 1920 and 1997.

	1920	2002
Motortrucks (including pickups)	591	24,805*
Tractors	1,075	19,589

Source: 1920 Census and 1997, 2002 Census of Agriculture.

on Wyoming farms in 1920 and 2002. Consider that in 1920 only 28.3 percent of Wyoming farms had telephones, 6.6 percent had water piped to the house, and only 4.6 percent had gas or electric light (Commerce, 1920). As we enter the information age, all these technological features are taken for granted because they are found on virtually every agricultural operation in the state.

The impact of mechanization was a double-edged sword. As tractors and other machinery became more commonplace, agricultural productivity soared. Agriculturists were working just as hard, if not harder, with labor saving tools. New technology often adds work in the short run because there is a necessary learning period. Additional production led to lower prices in the market place. This led producers to produce even more to try and capture smaller and smaller profit margins. Smaller producers were squeezed out. A smaller land base meant they did not have the productive capacity to generate sufficient profits to stay in business. Neighbor bought out neighbor in attempts to form holdings large enough to generate income to support ever-larger operations. This process of consolidation has been going on since the 1930s, but it has been most pronounced since the 1960s.

Mechanization's impact on farm labor has been just as pronounced. Just as there were fewer proprietors due to consolidation, there was less need for hired labor to run more mechanized operations. Labor migrated to cities where manufacturing jobs offered higher wages.

The term mechanization encompasses just one aspect of technological change affecting agriculture. So far, only the mechanical aspect has been presented because of its obvious contribution. But there really has been a progression of technological

innovations that affected all of society throughout the twentieth century.

Hybridization and innovation in the biological sciences started to have a significant impact in the 1950s. The mid-1980s ushered in the personal computer and the information age. Personal computers and embedded electronics are now pervasive in agriculture. Chemical fertilizers have increased yields while herbicides and pesticides have helped ensure the success of the crop. New drugs have helped increase the size and success of calf and lamb crops, while databases track their growth progress. Electronics have become essential on the farm and ranch.

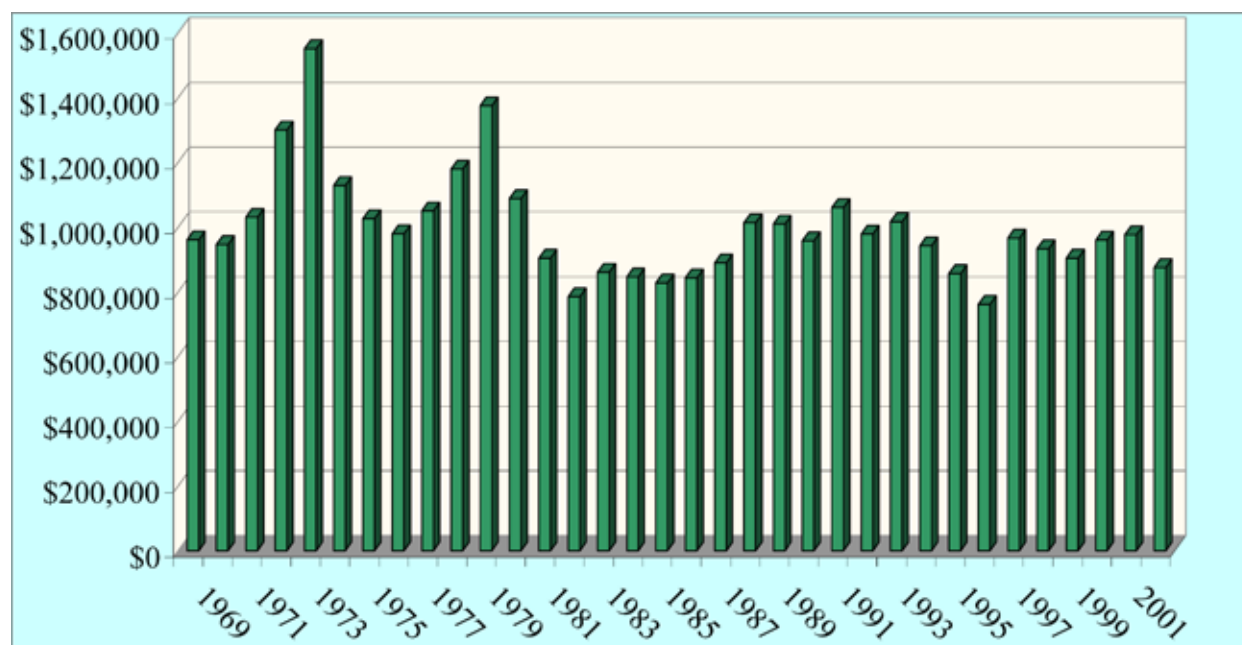
The trade-off is that capital expenses have increased as labor costs have fallen. Agriculture is now more capital intensive than ever, and operators are more dependent on capital markets for cash flow and more sensitive to interest rates.

The net result for the country is a more urbanized population that relies on fewer individuals for its food and fiber needs and that spends a smaller portion of its income to supply those needs. The farm population stood at 29.9 percent of the national population in 1920 and was an even higher 34.6 percent for the young state of Wyoming (Commerce, 1920). By the close of the century, the farm population was so small that it was no longer counted; however, current estimates place it at less than 2 percent (Rathge and Highman, 1998).

Cash Receipts

Figure 12 shows Wyoming's agricultural producers' total cash receipts for the years 1969-2002. The shape of the graph mirrors the trend in national farm receipts. The significant features are two spikes in receipts in the 1970s. These spikes would

Figure 12. Total cash receipts, Wyoming agriculture, 1969-2002*



**Dollar amounts represent thousands of dollars. For example, the value \$1,400,000 actually represents \$1.4 billion. All data has been converted into real dollars, adjusted for inflation to 2002 dollars.*

not have been nearly as high had it not been for a compounding effect that dramatically increased commodity prices during that same time period. Both spikes are at peaks in the cattle cycle; however, the earlier spike was exacerbated by a combination of events following a period of adverse weather that affected several major world grain production areas.

The United States also adopted a free-floating exchange rate in 1973. The Soviet Union opted to avoid rationing by supplementing grain inventories through imports (USDA, U.S. Export Performance, 1997). As the value of the dollar dropped, grain exports escalated, driving up cattle and feed prices in the United States (Knutson, Penn, and Boehm, 1990). Exports continued to grow throughout the 1970s, as did land prices and machinery purchases. The later spike was caused by a combination of cyclically lower beef supplies and high levels of inflation (USDA, Developing Marketing Spreads, 1980) pushing cattle prices up 30 percent from 1978 to 1979 (Wyoming Agricultural Statistics, 1980).

Yet, beyond those two significant events, cash receipts, in real terms, received by Wyoming agricultural producers have remained fairly steady. Economists use the term “real” to refer to inflation adjusted dollars. That is, dollar values for different years have the effects of inflation removed by “deflating” them to a single year for comparison. Including the 1970s spikes, total annual cash receipts averaged \$994 million (2002 dollars). Even so, a downward trend that started in the early 1990s appears to have bottomed in 1996. There was modest improvement in 1997. Average receipts for 1997 were \$101,867 on a per proprietor basis. (The Bureau of Economic Analysis counts “proprietors” instead of “farms” as in the Census). BEA counted 8,870 proprietors in 2002. On a per proprietor basis, cash receipts averaged \$98,742 (2002). This dip in per proprietor receipts is likely the result of drought.

Figure 13. Total production expenses, Wyoming agriculture, 1969-2002.



Source: Bureau of Economic Analysis, 2004.

Production Expenses

Figure 13 shows total production expenses for Wyoming agriculture. This graph reveals two spikes similar to those in Figure 12, but the early 1970s spike is muted. The fact that production expenses were not as high as receipts during this period was probably due to producers selling into markets for higher than normal prices but not having the high production costs (Note the differences in the bars for the year 1973 in Figures 12 and 13.). These combined effects led net real income per farm to rise 73 percent nationally for 1970 to 1973 (Knutson, Penn, and Boehm, 1990).

In contrast, the late 1970s to mid-1980s were an extended period of high inflation and high interest rates. High interest rates have a particularly detrimental effect on the agricultural sector since it relies heavily on credit. The surge in production expenses that started in 1978 and peaked in 1979 actually lasted until the mid-1980s. The reason for this is that many agricultural operators who depend on financial institutions for operating capital were forced to borrow at higher and higher rates to finance and refinance operations. The cost of credit was a factor in effectively wiping out profits

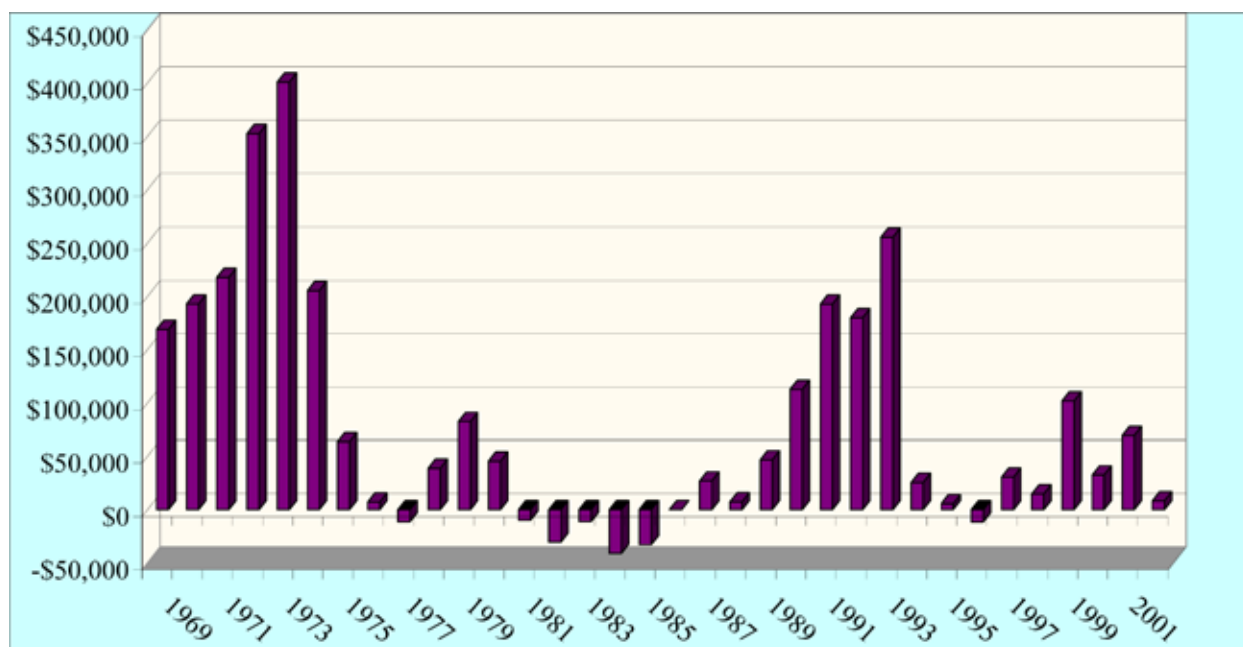
and reducing solvency in this sector during the first half of the 1980s (Figure 14), contributing to the farm crisis. Particularly hard hit were those producers who had borrowed heavily during the 1970s to expand operations during a time of high exports. When monetary policy shifted in the early 1980s to control inflation, farm exports, commodity prices, and farm income dropped off (Knutson, Penn, and Boehm, 1990).

With the exception of the two spikes and their obvious detrimental effects on the sector, production expenses, in real terms, were relatively flat from 1969 to 2002. The average annual total expenses are \$1.02 billion (2002 dollars). In real terms, there is little difference between the late 1960s and the early to mid-1990s. Annual production expenses on a per proprietor basis for 2002 were \$97,311.

Proprietor's Income

Total net farm proprietor's income is shown in Figure 14. The values in this graph are the result of the total cash receipts minus total production costs. This graph shows how strongly interest rates affect agricultural income. Real interest rates were negative five of seven years; from 1973 to 1979

Figure 14. Wyoming total net farm proprietor's income, 1969-2002.



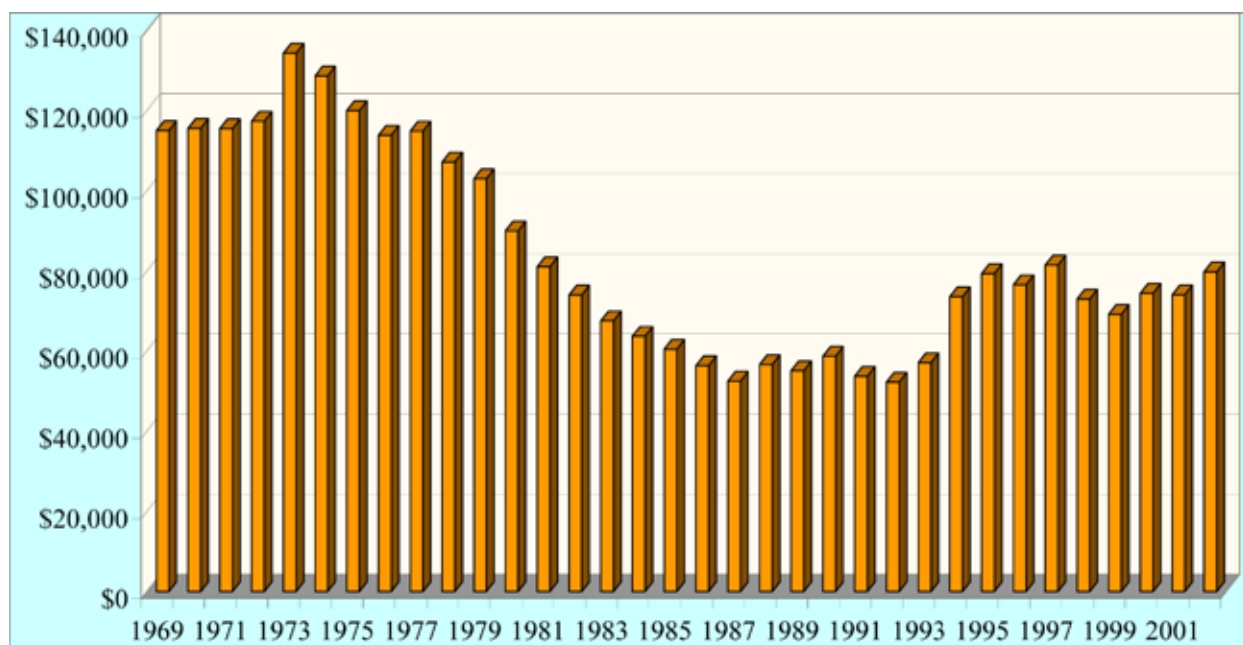
Source: Bureau of Economic Analysis, 2004.

(rapidly rising prices outstripped the rate of change in interest rates). Negative interest rates encouraged producers to borrow and expand. When monetary policy shifted in the early 1980s, the result was a reduction in agricultural exports, rising interest rates, and decreased farm income and investment in agriculture (Knutson, Penn, and Boehm, 1990). Due to the length of loans, there is a lag between an interest rate hike and when it is felt in the marketplace. Proprietor's income plummeted in the years after 1973 as interest rates rose (Figure 14). Profitability returned briefly in the late 1970s with a good cattle market only to be swept away with the higher interest rates, inflation, and fuel prices during the farm crisis. Significant profitability did not return until interest rates started to come down in the late 1980s and early 1990s. Recent profitability is probably due to good cattle prices, although the effects of the drought in 2002 can also be seen. Total net farm proprietor's income for 2002 was \$8,305,000 (2002 dollars). The net farm proprietor's income for 2002 was just \$936 per proprietor. (This is an average figure that includes part-time operators. It does not account for size of operation).

Average proprietor income shows that even though there is wide variation, income over the long term is still positive. Average total net proprietor's income for the 34-year reporting period was \$80.5 million or \$9,554 per proprietor. This number includes the extraordinarily profitable years prior to 1975. Excluding those years, the 28-year period from 1975 to 2002 shows average total net farm proprietor's income of \$42.8 million or \$4,856 per proprietor (2002 dollars). The shorter period is more indicative of the volatile nature of proprietor's and agricultural income in general. There were 26 positive years and 8 negative years, plus extremely wide variation for the 34-year period. The high was \$400.6 million (\$50,159 per proprietor) in 1973 and the low was in 1984 at -\$40.9 million (-\$4,448 per proprietor).

Farm household income is difficult to categorize due to the disparate size structure of agricultural firms. The figures presented here include part-time as well as full-time proprietors. In general, at the national level, farming households are financially better off than the national average. This is due not to farm income, but to off-farm income. Average

Figure 15. Wyoming total farm wages, 1969-2002.



Source: Bureau of Economic Analysis, 2004.

operator household income has kept pace with the average U.S. household income for the past 45 years; however, statistics show that the share of agricultural operator's household income from farming or ranching has trended downward since the mid-1980s. This national data estimates that off-farm income accounts for about 90 percent of total farm operator household income (USDA Agricultural Income and Finance, 1999), indicating that family members are working off-farm to keep the operation viable.

The trend in increasing off-farm income is not new. Available data indicates that off-farm income has been important to farm households for decades. Hoppe and Korb (1997) state that "operator households relied on off-farm income for at least 50 percent of their income as far back as the early 1960s." And "even in the 1930s, 30 to 41 percent of farm resident's disposable personal income came from off-farm sources."

The number of proprietors has had only a slight effect on total proprietor income. Proprietor employment in Wyoming fluctuated with the economic forces affecting agriculture. According to Bureau of Economic Analysis figures, the low year was 1975

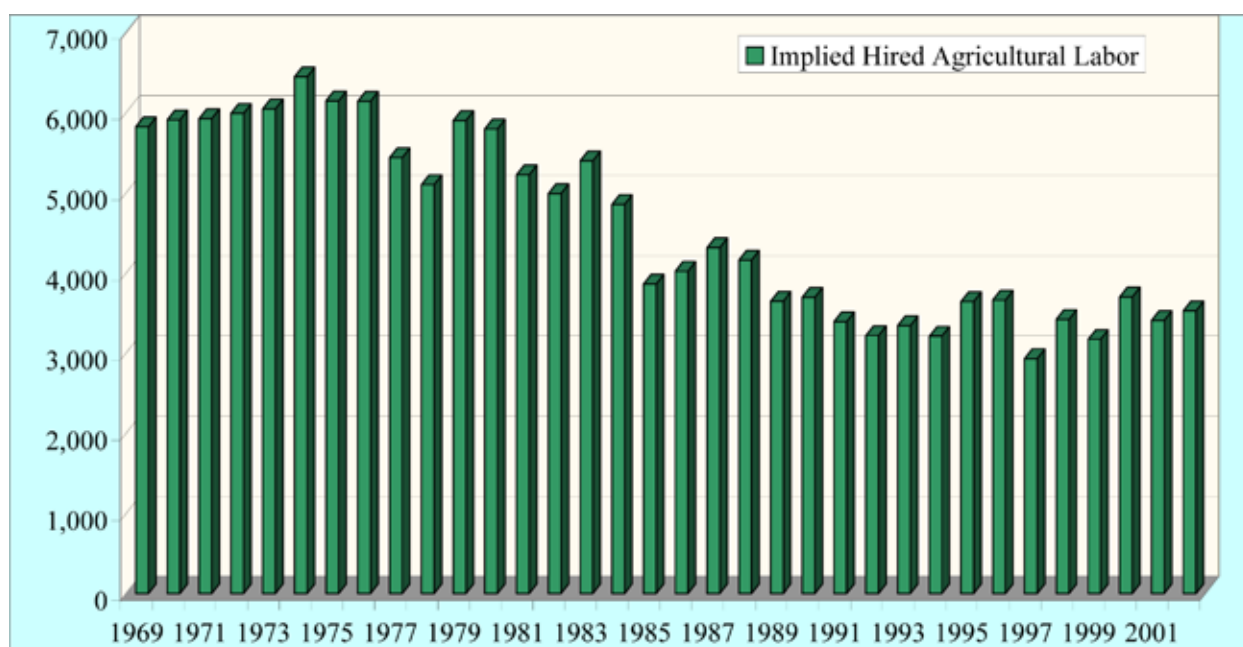
with only 7,844 proprietors. The high was in 1983 when there were 9,374 proprietors. The number of agricultural proprietors in Wyoming increased 3.48 percent from 1969 to 2002 (BEA-REIS, 2004).

Hired Farm Wages

Figure 15 shows total farm wages, in thousands of inflation adjusted dollars (2002). This graph represents the aggregate amount received by hired farm workers in the state, excluding proprietors. The significant features include the steep decline from 1974 to 1987, followed by a slight rebound and then a relatively stable period since 1994. The reason for this is not readily apparent unless it is understood that total income value is closely associated with the number of people working. Wyoming hired farm labor, shown in Figure 16, provides useful evidence in this case.

Since 1974, hired agricultural employment in Wyoming has declined by 39 percent (Figure 16). The decline is attributed to technology that changed production practices (mechanization), as well as increased financial pressure on producers in the 1980s. The drop in the number of hired workers explains the drop in total farm wages seen in Figure 15.

Figure 16. Wyoming hired farm labor 1969-2002.



Source: Bureau of Economic Analysis, 2004.

Figure 17. Average farm wages per hired worker, 1969-1997.



Source: Bureau of Economic Analysis, 2004.

Declining numbers does not necessarily mean declining salaries. Figure 17 shows average annual farm wages per hired worker. Note that wages dipped, in real terms, during the 1980s, a period of instability in the sector, but have since rebounded and are currently above historic levels. The average

wage per worker in 2002 was \$22,617, up from \$21,734 the year before. Agriculture added 599 hired-labor jobs between 1997 and 2002. There is speculation that the more stable number of jobs with a higher salary base is indicative of the hiring of more farm and ranch managers in the state.

The Counties

State level data can be misleading as to the realities of the economics at the local level. This is especially true in Wyoming where distance and diverse geography create more disparate regional economies. Looking at data at the county level can be instructive in trying to understand how some regions can do better than others. Figure 18 shows Wyoming agricultural employment by county. Only four counties showed growth in total agricultural employment during the period — Fremont, Albany, Uinta and Laramie. This was the result of increases in the number of proprietors and not hired labor. Figures 19 and 20 show proprietors and hired labor by county. These are the components of agricultural employment. Table 3 (page 53) is included to show the actual employment numbers, as well as the percent of change over the time period. Some counties have relatively small numbers of agricultural employment. Consequently, small changes in employment appear as larger percentage changes.

Hired Agricultural Labor-County Level

Hired agricultural labor has declined or was unchanged in 22 of Wyoming's 23 counties from 1969 to 2002 (Figure 19 and Table 3). Again, the major reason is the consolidation of agricultural enterprises due to the increased productivity of mechanization. The authors suspect that land conversion, or at least subdivision of land into smaller parcels, plays a part in several counties that have experienced higher rates of development in recent years. This is particularly true of Lincoln, Park, Teton, Sheridan, and Sublette counties, which are in close proximity to national park and/or forest recreation opportunities. Other counties, such as Sweetwater and Carbon, have seen an increase in mineral activity and a reduction in the number of sheep operations, as well as some development. Counties that rely heavily on agriculture, such as Niobrara, have seen employment numbers decrease due almost entirely to consolidation in the industry.

Agricultural Proprietors - County Level

The change in the number of agricultural proprietors on a county basis is shown in Figure 20 and Table 3. The overall increase in the number of proprietors by 8 percent reflects the increase in smaller holdings in some counties, even as others saw dramatic decreases due to consolidation. Though the data is not clear, it implies that those counties with some natural amenity value, such as national forest proximity, access to a larger regional center (jobs), and retention of some agricultural ethic in the community, have become more developed due to higher demand for land. This view is borne out in Albany, Carbon, Fremont, Natrona, Lincoln, Sheridan, Sublette, and Sweetwater counties, which show significant gains in proprietorship. Counties with decreases in proprietorship suffer from either consolidation in the industry or land going out of agriculture and into rural residential housing developments. The latter is true of counties such as Park and Teton. Those counties with large agricultural components, such as Crook, Niobrara, and Goshen, have seen proprietorships drop due to consolidation in the industry. Varying degrees of crossover between these two factors likely occur in all counties; however, the data used in this report cannot be used to separate out those effects.

Trends Going Forward

The trends of consolidation in agriculture and parceling out land for smaller enterprises are likely to continue. Profitability will continue for larger operations that are innovative users of resources in a changing economic climate. There are signs that the recent upsurge in agricultural productivity is leveling off. Public research and development (R&D) monies have been stagnant since 1976. Private R&D monies outpace public funds but have been growing at about 1 percent per year (USDA, Productivity, 1999). What this means for agricultural employment is probably a leveling off in the drop in hired labor and maybe even a slight upswing in numbers because of the use of hired managers. The

Wyoming Department of Employment and the Economic Analysis Division expects the number of farm managers, workers, and equipment operators to grow a modest 10 to 11 percent between 1998 and 2008 (Wyoming DOE-DAI, 2000).

The number of proprietors could grow slightly as more smallholdings are created; however, the aging demographics of proprietors hints that existing operations may have increased opportunities available in the next five to 10 years as some older operators retire or pass on. The net result is that proprietor numbers statewide should stay in a fairly narrow range during the coming years, but more significant moves may be made at the county level.

Real cash receipts for Wyoming agricultural producers have been fairly constant over time, with the exception of the two spikes in the 1970s, showing that the value of agricultural production has maintained its income generating capacity (Figure 12). Similarly, real production expenses (with the exception of the first half of the 1980s) have been relatively flat showing that producers face a fairly even set of production constraints from year to year (Figure 13).

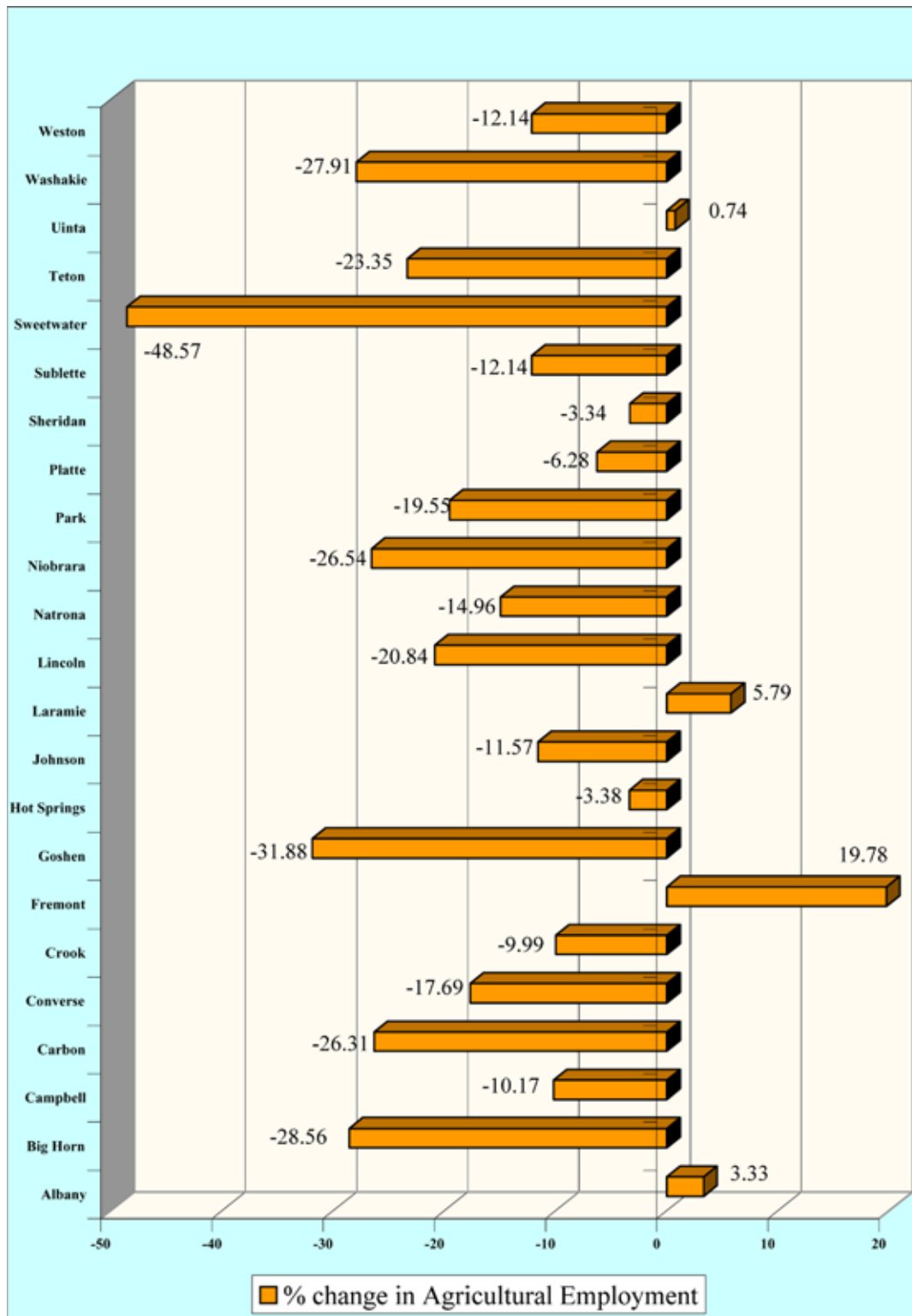
Conversely, net proprietor's income has fluctuated dramatically even as the number of proprietors has increased only slightly in Wyoming. This apparent volatility when compared to total cash receipts and total production costs (see Figures 12-14) is partly due to the "smallness" of the net proprietor's

income number. That is, the large numbers in total returns and total production expenses mask the volatility in the differences at the individual proprietor level. The cattle cycle and macroeconomic forces (particularly interest rates) in the 1970s and 1980s are the keys to the variation seen in net proprietor's income. Stable interest rates in the last 15 years have helped return production costs to longer-term levels, meaning proprietor income is more dependent on the cattle cycle and individual operator's cost structure.

While the number of hired workers has decreased substantially since 1974, average wage per hired worker has increased in recent years. This reflects the continuing trend, started in the 1920s and accelerated in the 1970s, toward mechanization in agriculture. Increased wages per worker may signal a trend toward more salaried management labor in agriculture.

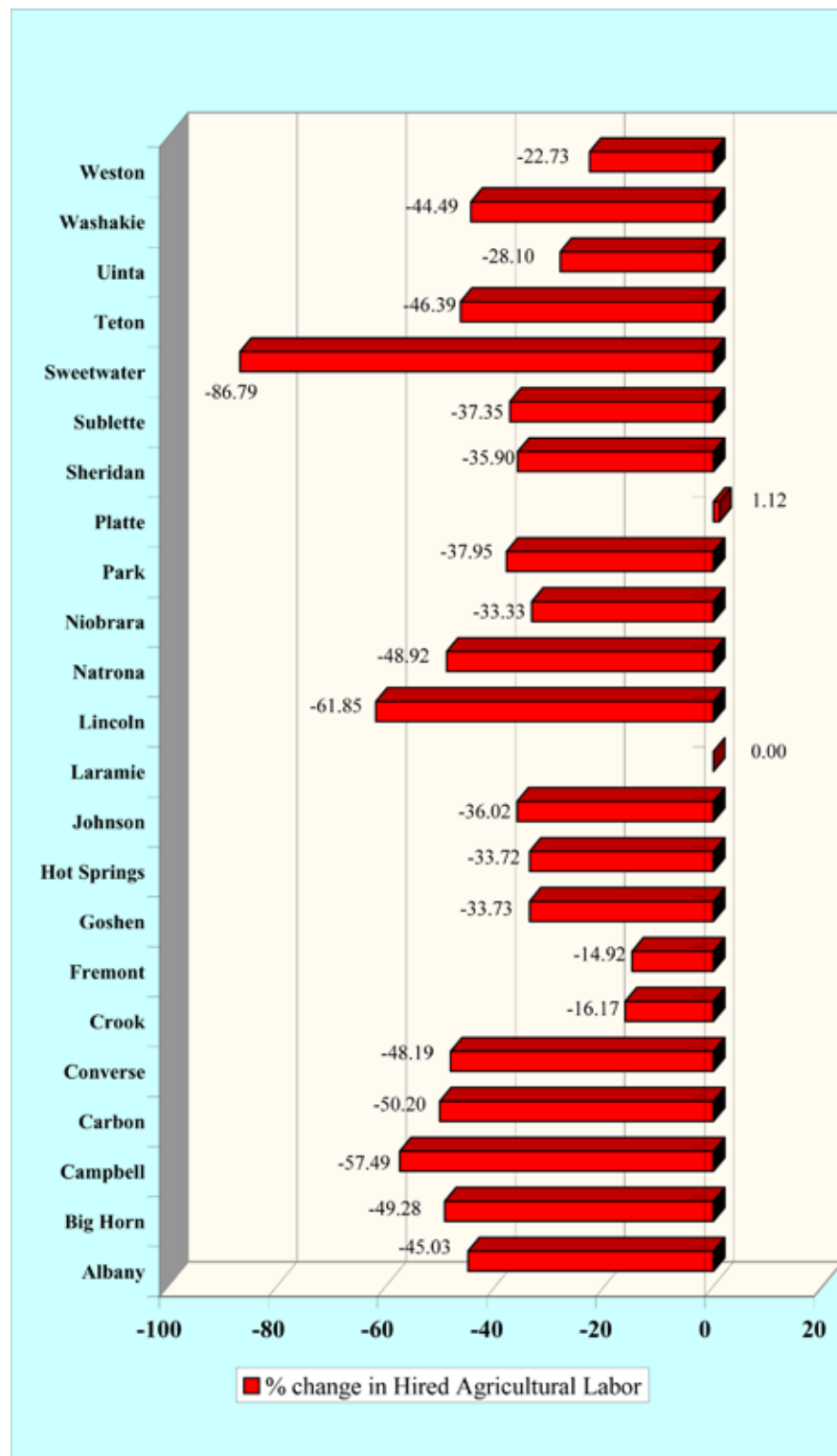
At the same time, the parceling out of agricultural land near forests and regional centers has allowed more small landowners to engage in agriculture while maintaining off-farm income sources. These small enterprises rarely employ hired labor. While the viability of many of these enterprises is in question, their presence is not. The gains and losses in employment are not evenly spread across Wyoming's counties. They reflect changing land use patterns as more individuals try to include quality of life issues in their lifestyles. These trends appear to be continuing for the foreseeable future.

Figure 18. Change in Wyoming agricultural employment by county, 1969-2002.



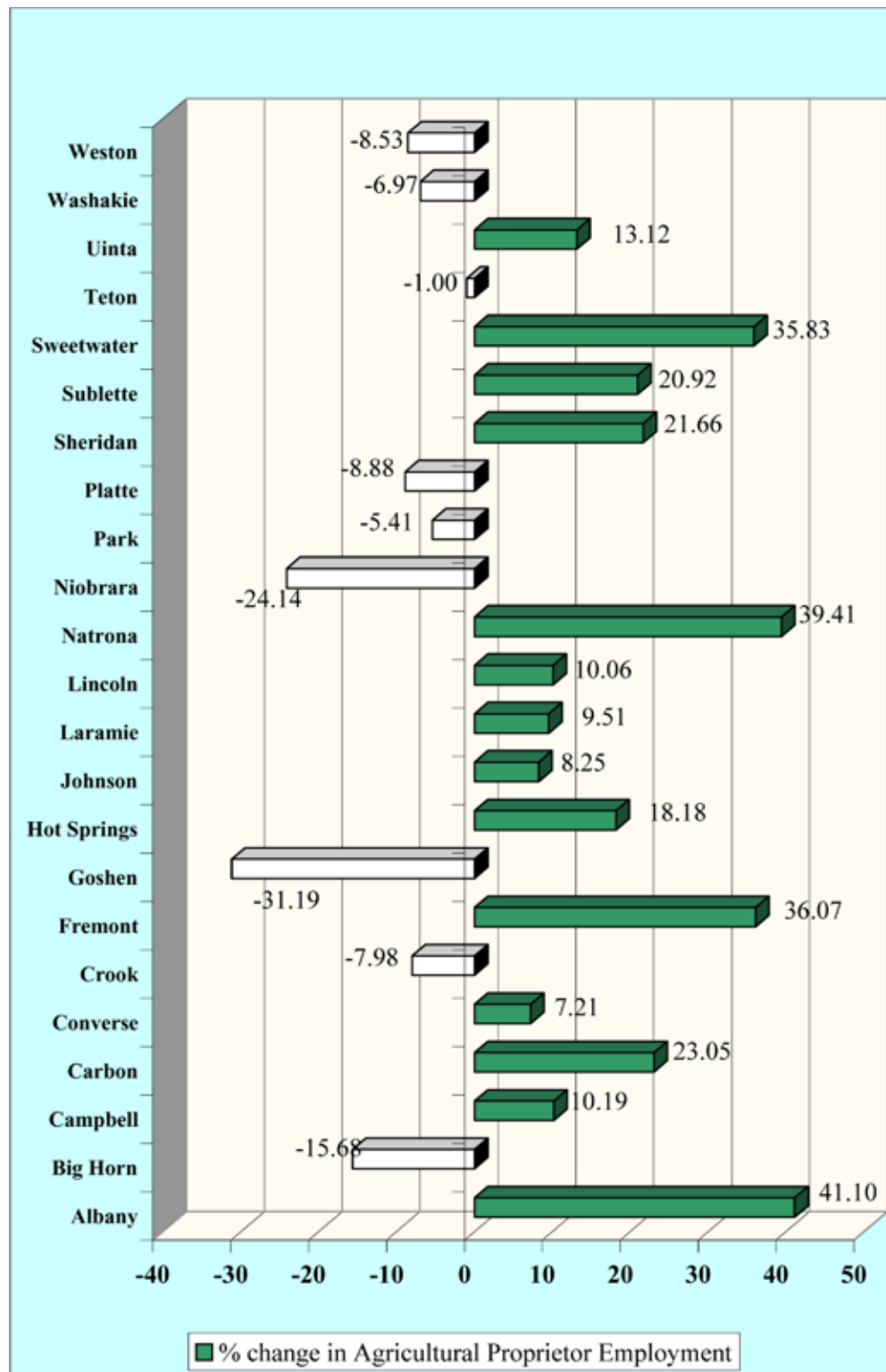
Source: Bureau of Economic Analysis, 2004.

Figure 19. Change in Wyoming hired agricultural labor by county, 1969-2002.



Source: Bureau of Economic Analysis, 2004.

Figure 20. Change in Wyoming agricultural proprietors by county, 1969-2002.



Source: Bureau of Economic Analysis, 2004.

Table 3. Wyoming agricultural employment by county and category, 1969-2002.

	Agricultural Employment			Hired Agricultural Labor			Agricultural Proprietors		
	1969	2002	% change			% change			% change
Albany	390	403	3.33%	171	94	-45.03%	219	309	41.10%
Big Horn	900	643	-28.56%	345	175	-49.28%	555	468	-15.68%
Campbell	688	618	-10.17%	207	88	-57.49%	481	530	10.19%
Carbon	745	549	-26.31%	502	250	-50.20%	243	299	23.05%
Converse	554	456	-17.69%	249	129	-48.19%	305	327	7.21%
Crook	681	613	-9.99%	167	140	-16.17%	514	473	-7.98%
Fremont	986	1,181	19.78%	315	268	-14.92%	671	913	36.07%
Goshen	1,236	842	-31.88%	332	220	-33.73%	904	622	-31.19%
Hot Springs	207	200	-3.38%	86	57	-33.72%	121	143	18.18%
Johnson	527	466	-11.57%	236	151	-36.02%	291	315	8.25%
Laramie	881	932	5.79%	345	345	0.00%	536	587	9.51%
Lincoln	854	676	-20.84%	367	140	-61.85%	487	536	10.06%
Natrona	528	449	-14.96%	325	166	-48.92%	203	283	39.41%
Niobrara	471	346	-26.54%	123	82	-33.33%	348	264	-24.14%
Park	1,013	815	-19.55%	440	273	-37.95%	573	542	-5.41%
Platte	685	642	-6.28%	178	180	1.12%	507	462	-8.88%
Sheridan	808	781	-3.34%	351	225	-35.90%	457	556	21.66%
Sublette	453	398	-12.14%	257	161	-37.35%	196	237	20.92%
Sweetwater	385	198	-48.57%	265	35	-86.79%	120	163	35.83%
Teton	197	151	-23.35%	97	52	-46.39%	100	99	-1.00%
Uinta	403	406	0.74%	121	87	-28.10%	282	319	13.12%
Washakie	455	328	-27.91%	254	141	-44.49%	201	187	-6.97%
Weston	346	304	-12.14%	88	68	-22.73%	258	236	-8.53%
Total			-13.87%			-39.41%			3.48%
Average			-14.15%			-37.71%			8.03%

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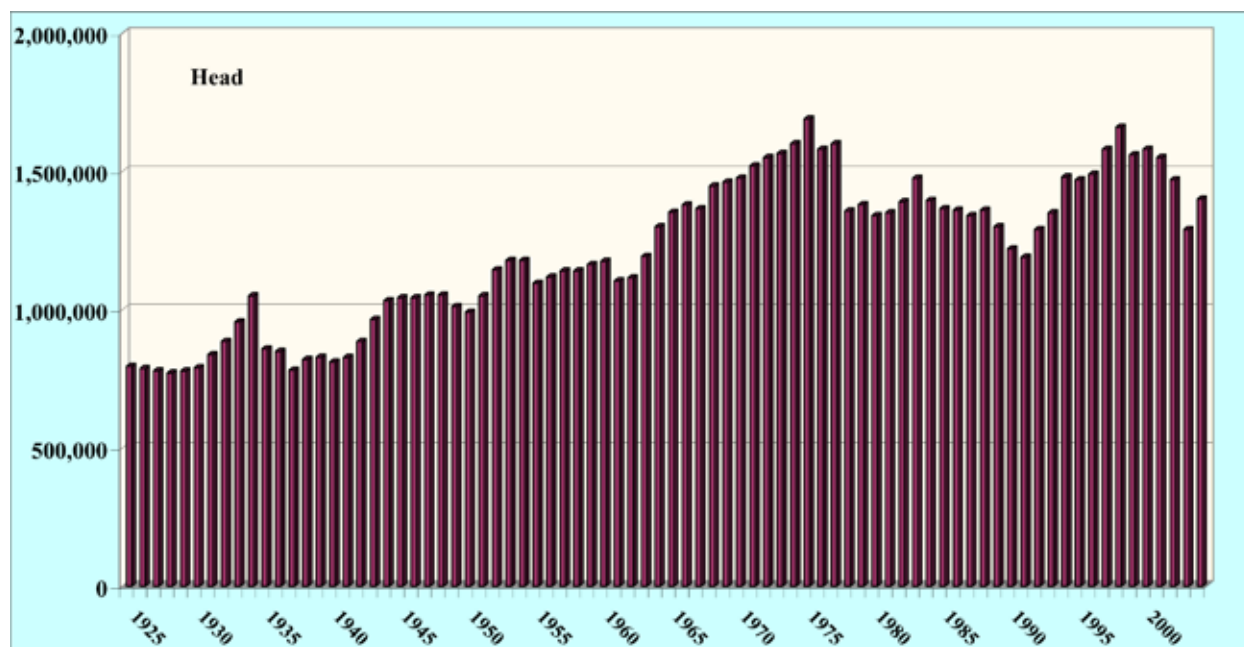
Level of Agricultural Production (1925–2002)

Previous chapters explored changes in Wyoming's agricultural sector during the last decades of the twentieth century. In particular, these chapters have focused on age of operator, income, size of operation, and employment. Each of these subjects is integral in understanding how changes affect this sector of Wyoming's economy. Many of the trends identified provide challenges for traditional agriculture in the sense that change, fostered by technology and trade issues (mechanization and globalization), is forcing a rethinking of long-held cultural practices and traditions. The following pages contain graphs, tables, and commentary on each of the major crop and livestock commodities produced in Wyoming over the past 78 years. A discussion of the roles technology and government support programs have played in globalization and the level of production and its impact on agriculture is included.

Seventy-eight years have seen little change in the type of crops and livestock raised in Wyoming. Cattle are still the dominant livestock species, but their edge over sheep and lamb has been greatly extended. The same crops are still grown, but ratios have changed because hybridization has allowed more drought- and cold-resistant varieties to grow in the state. Changes in the level of production of each commodity have varied for different reasons. Mechanization, hybridization, fertilization, and advanced cultural practices account for most of the increases. Decreases are mainly due to changes in technology and consumer tastes and preferences. Still other commodities continue at relatively unchanged levels due to physical production constraints.

I confess myself to be a great admirer of tradition. The longer you can look back, the farther you can look forward.
-Winston Churchill

Figure 21. All cattle and calves, Wyoming (1925-2004).



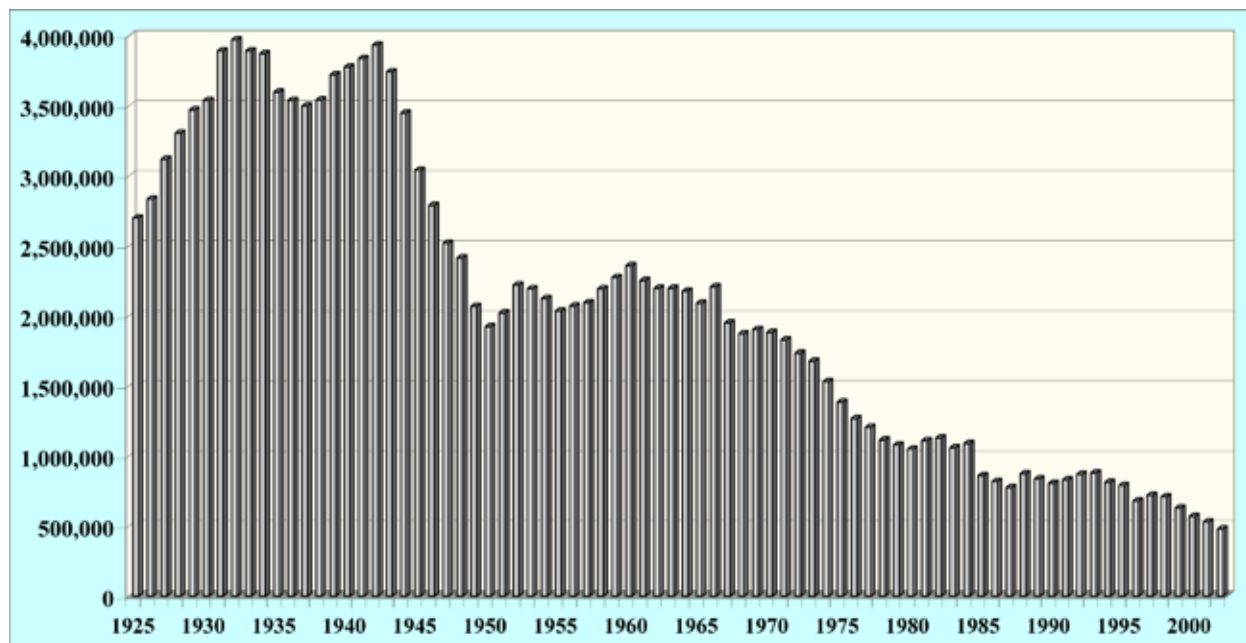
(Data Source: Wyoming Agricultural Statistics, 2004)

Cattle

Cattle are the major agricultural production commodity in Wyoming. In 2002, cattle and calves accounted for 72.9 percent of all cash receipts received by Wyoming producers (Wyoming Agricultural Statistics, 2003). Many of the crops grown in the state are feed crops for cattle so their production directly supports the cattle industry. Consequently, the cattle market significantly influences many Wyoming producers whether they own cattle or not. Figure 21 shows all cattle and calves on Wyoming farms and ranches during the 78-year period from 1925 to 2002. The trend was generally upward until the mid-1970s, which was a period of insta-

bility in agriculture as high interest rates and high inflation eroded producers' returns and forced sales of livestock. The peak in the cattle cycle occurred in 1975, and producers sold into this market, reducing herd numbers. The farm crisis in the first half of the 1980s kept herd numbers low. Poor weather and low prices further cut into the numbers, making 1991 the lowest inventory year since the mid-1960s. In recent years, herds have slipped primarily due to drought. A peak for the series was in 1975 with 1,690,000 head. The number of cattle and calves on Wyoming farms and ranches as of January 1, 2002, stood at 1,470,000 head (Wyoming Agricultural Statistics, 2003). Cattle numbers in Wyoming have increased 84.9 percent since 1925.

Figure 22. All sheep and lambs, Wyoming (1925-2002).



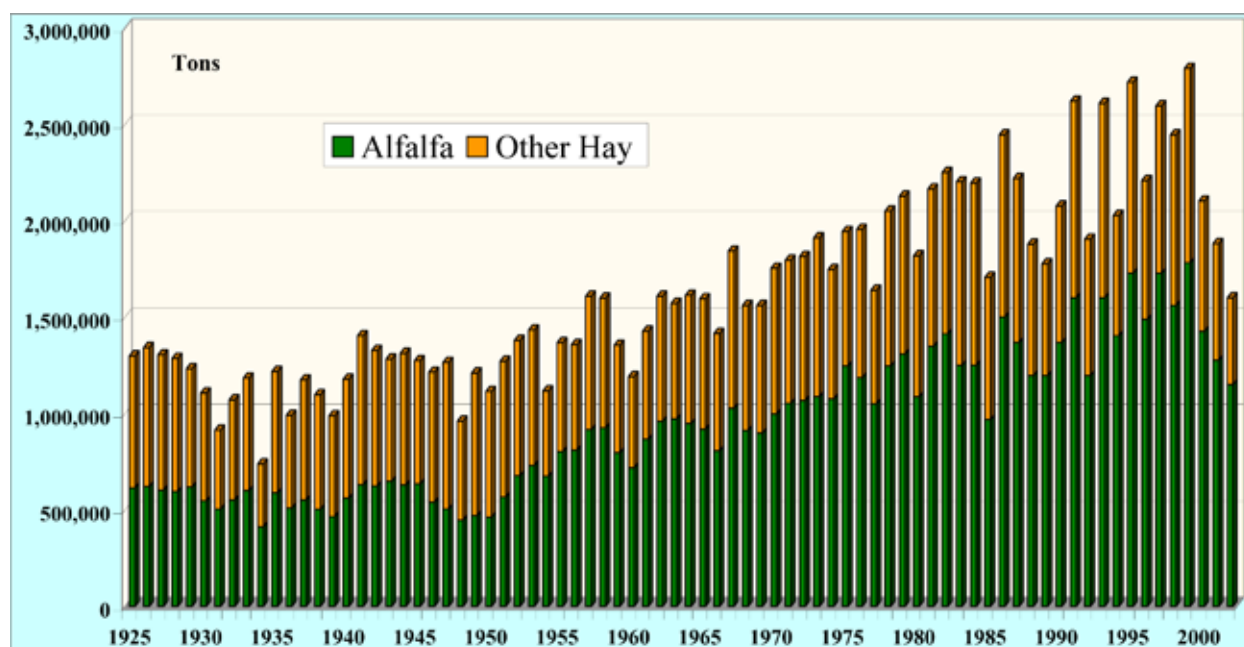
(Data Source: Wyoming Agricultural Statistics, 2003)

Sheep and Lambs

Sheep came to prominence in Wyoming after the disastrous winters of the late 1880s. Ranchers raising sheep homesteaded large areas of land with lower rainfall, and less suited to cattle. Sheep were the majority livestock in value and number from the 1890s through the first decade of the twentieth century (Commerce, 1920). The historical peak year reported in the census was 1910 at 5,397,161 head. Sheep numbers declined dramatically during the second decade of the twentieth century. By 1920, there were only 1,859,775 head and the value of cattle was twice that of sheep. Figure 22 shows all sheep and lambs on Wyoming farms and

ranches during the study period. Sheep numbers continued to increase through the 1920s to a 1932 high of 3,972,000 head. Numbers almost peaked again during the war years but have steadily declined ever since. The contraction of the sheep and wool industry was caused by the advent of synthetic fibers and changing consumer tastes and preferences. In more recent years, the high cost of labor and the globalization of trade have added pressure on the industry. Sheep, lambs, and wool accounted for just 2.46 percent of all cash receipts in 2002 and just 2.90 percent of all livestock receipts (Wyoming Agricultural Statistics, 2003).

Figure 23. All hay production, Wyoming (1925-2002).



(Data Source: Wyoming Agricultural Statistics, 2003)

Table 4. Alfalfa

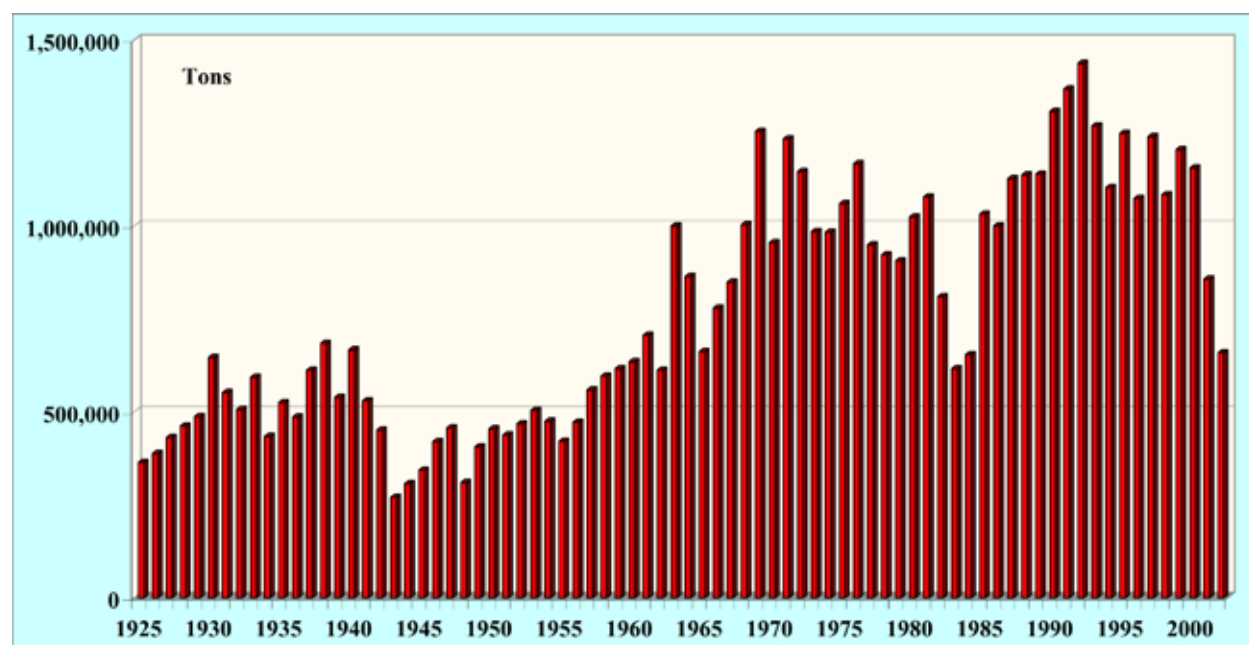
	1925-1934 Avg.	1993-2002 Avg.	Percent Change
Yield (tons/acre)	1.50	2.22	48.00
Acres harvested	377,400	547,000	44.94
Production (tons)	566,300	1,354,100	399.11

All Hay

Hay is the major feed crop for wintering livestock in Wyoming. Figure 23 shows the two categories for which statistics are kept. Alfalfa hay is normally an irrigated crop in Wyoming because of its higher water requirement. There were about 170,000 acres of alfalfa in Wyoming in 1909 (Commerce, 1920). Production acreage had increased to a historical high of 660,000 acres by 1999 (Wyoming Agricultural Statistics, 2000). Other (non-alfalfa) hay is mostly native hay on improved meadows. Acreage for other hay peaked at 822,000 acres in 1949.

Currently, there are 450,000 acres devoted to other hay production and 500,000 acres devoted to alfalfa. The fall off in production in recent years is due to drought in several parts of the state. The difference in production levels twentieth century; alfalfa yields averaged 1½- to 1¾- ton per acre for the same period. Alfalfa yields started moving upward in the mid-1950s with the introduction of more winter-hardy varieties to Wyoming. Table 4 shows how average alfalfa yields, acreage, and production have changed over the study period.

Figure 24. Sugar beet production, Wyoming (1925-2002).



(Data Source: Wyoming Agricultural Statistics, 2003)

Table 5. Sugar beets

	1925-1934 Avg.	1993-2002 Avg.	Percent Change
Yield (tons/acre)	11.55	19.81	71.51
Acres harvested	42,200	54,910	30.12
Production (tons)	486,300	1,089,600	124.06

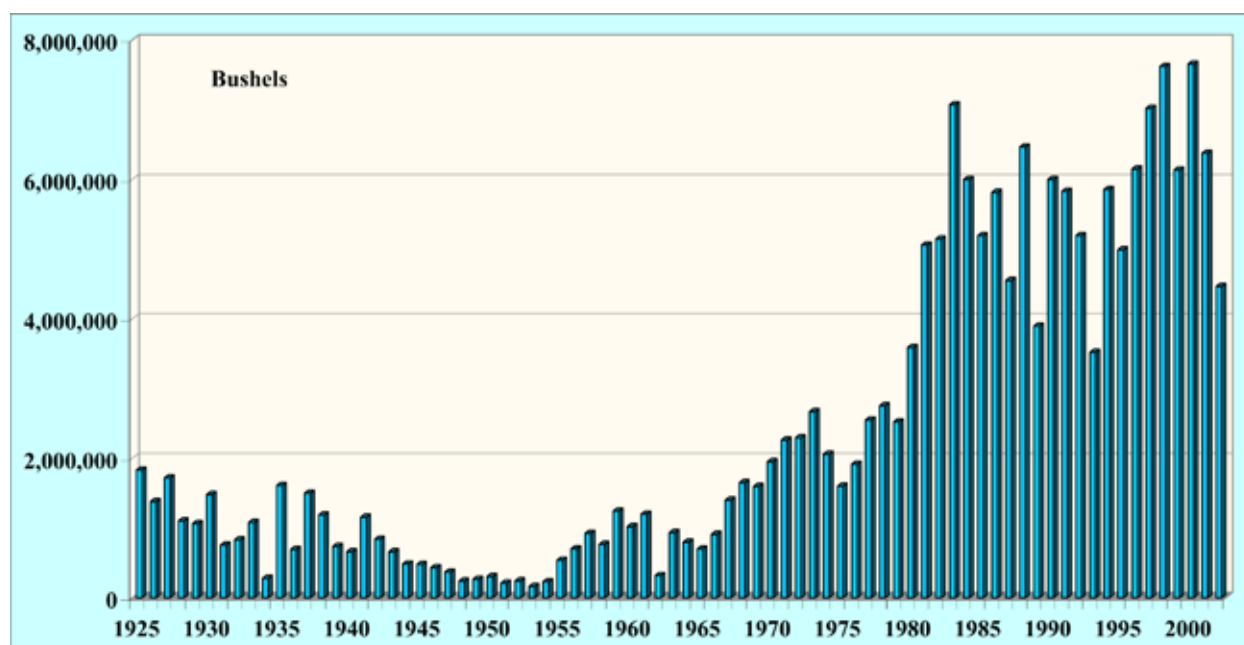
Sugar beets

Sugar beet production was in its infancy in the United States at the beginning of the twentieth century. Wyoming acreage was listed as 1,181 acres in 1909 (Commerce, 1920). Production continued in a cyclical pattern until the mid-1950s when new chemicals offered greater weed control (Figure 24). Sugar beet acreage has been relatively stable since the mid-1960s, averaging about 540,000 acres per year. Advances in labor saving mechanical produc-

tion methods also helped increase production. The fall in sugar beet production in 2001 and 2002 is attributed to drought and related weather conditions.

Average sugar beet yield, acreage, and production are shown in Table 5. The increase in yield can be attributed to a variety of factors from better cultivation practices to the use of herbicides and pesticides to control weeds and nematodes.

Figure 25. Corn for grain production, Wyoming (1925-2002).



(Data Source: Wyoming Agricultural Statistics, 2003)

Table 6. Corn for grain

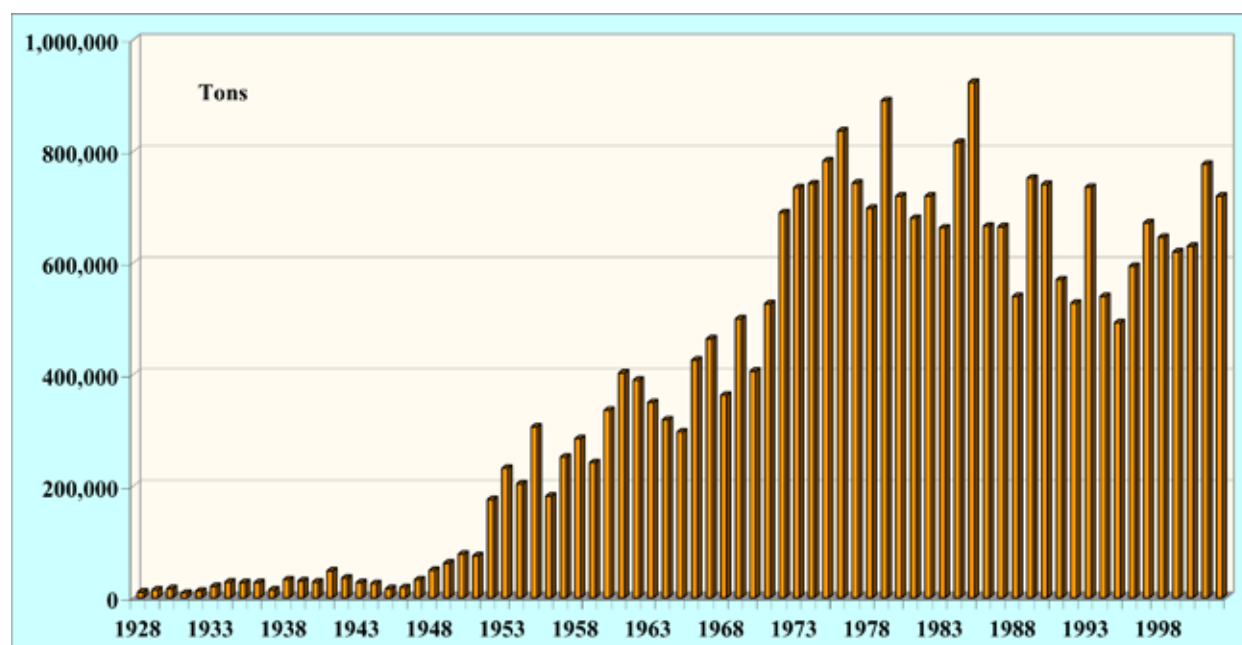
	1925-1934 Avg.	1993-2002 Avg.	Percent Change
Yield (bushels/acre)	14.07	119.00	745.77
Acres harvested	78,900	49,900	-36.76
Production (bushels)	1,152,700	5,978,900	418.69

Corn for Grain

Early varieties of corn were not well adapted to Wyoming's low humidity, cool nights, and short growing season, so corn production was effectively confined to the eastern half of the state. Yet, corn is an important feed crop whether as grain or silage. Production in the early years reflects the marginal climate for corn in most of Wyoming (Figure 25). Acreage for the first 10 years in the series was similar to that of the early 1980s, but yields were about 1/8 that of the latter years. Table 6 shows

average yield, acreage, and production values for the first and last 10 years in the series. Note that even though acreage dropped, yield and production soared. Yields started increasing in the early 1960s and made significant gains after 1980 with the introduction of early maturation varieties. Most Wyoming corn is grown as an irrigated crop, except in Laramie County where some dry land corn is grown. In 2002, 35,000 acres of corn for grain were harvested in Wyoming.

Figure 26. Corn for silage production, Wyoming (1925-2002).



(Data Source: Wyoming Agricultural Statistics, 2003)

Table 7. Corn silage

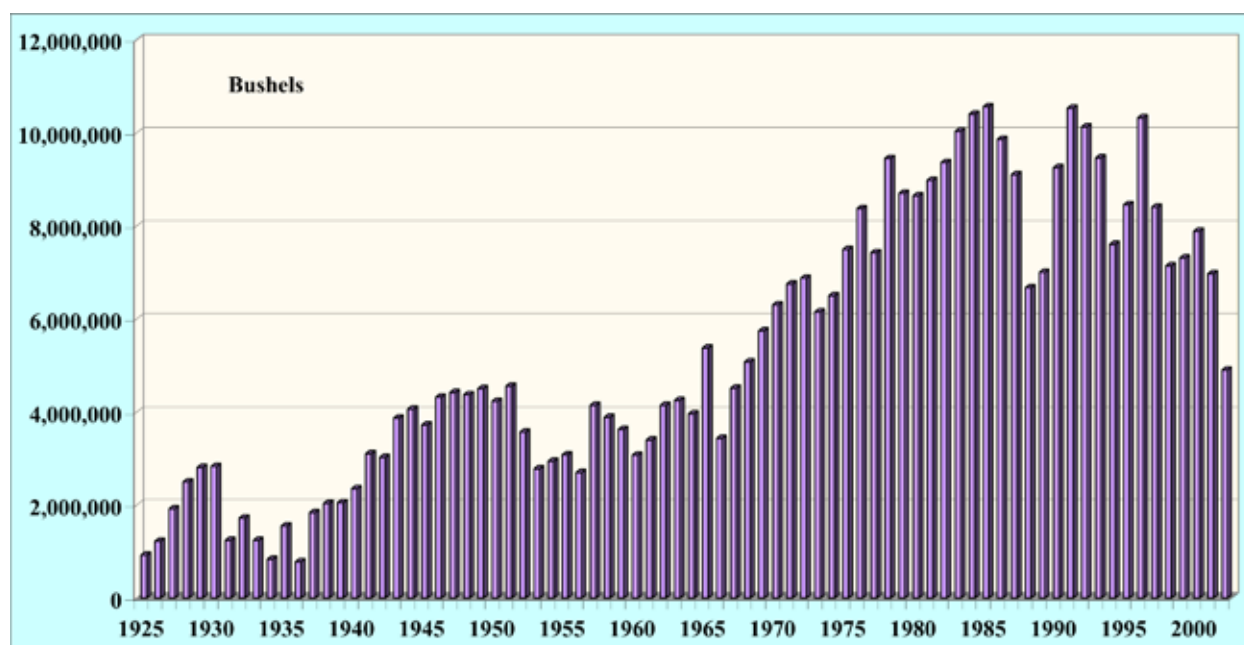
	1925-1934 Avg.	1993-2002 Avg.	Percent Change
Yield (tons/acre)	5.62	18.9	236.30
Acres harvested	3,700	34,200	824.32
Production (tons)	18,800	642,800	3,319.15

Corn Silage

Corn silage production was slow to take hold in Wyoming as shown in Figure 26. Not only were there problems with climate-adaptable corn varieties, but the technology of chopping and storing silage was slow in adapting to the region. Peak production occurred in 1985 with 924,000 tons. Average values for the first and last years in the series are shown in Table 7.

Total corn acreage (grain and silage) in Wyoming has remained in a narrow range since 1970, averaging 87,600 acres planted per year. Silage production has declined slightly, but corn for grain production has increased. New varieties of early-maturing corn have allowed producers to have a cash crop in corn for grain as opposed to silage, which is primarily fed on the farm.

Figure 27. Barley production, Wyoming (1925-2002).



(Data Source: Wyoming Agricultural Statistics, 2003)

Table 8. Barley

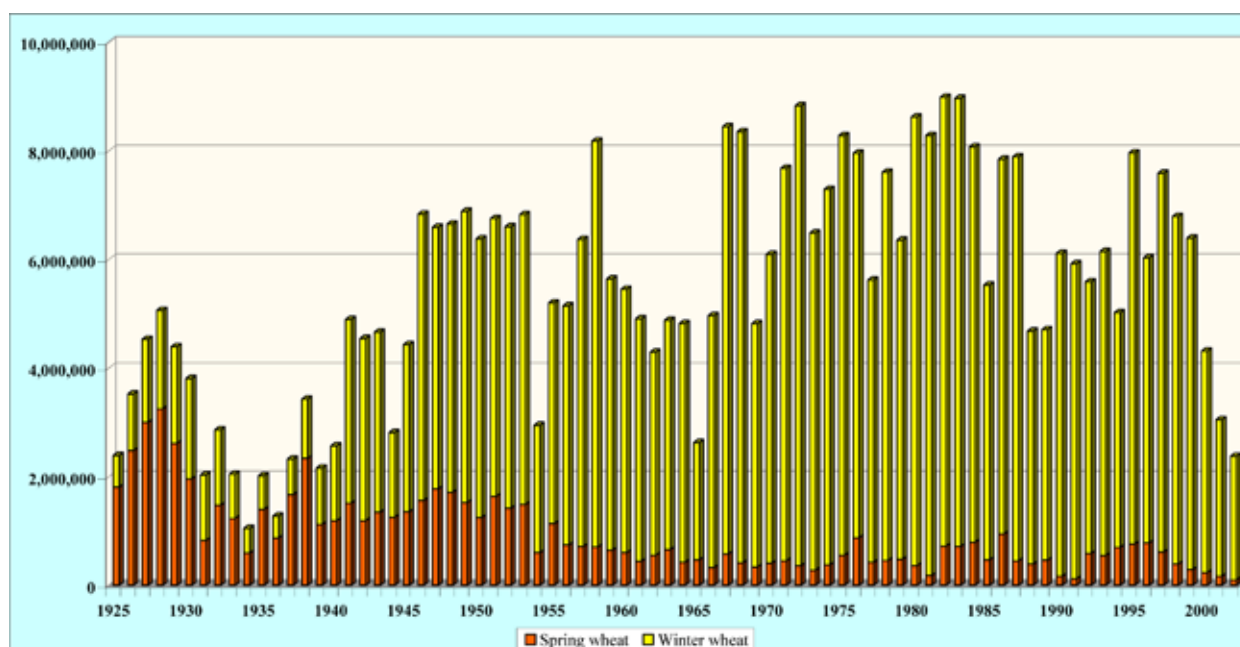
	1925-1934 Avg.	1993-2002 Avg.	Percent Change
Yield (bushels/acre)	21.90	82.2	275.34
Acres harvested	80,800	95,000	17.57
Production (bushels)	1,723,800	7,844,000	355.04

Barley

Figure 27 shows Wyoming barley production. Both malt and feed varieties have been present since the turn of the last century, but feed barley appears to have dominated early (data are scant). Barley does well at high altitudes and in cool climates, which makes it a good crop choice for Wyoming. Malt barley production expanded significantly in the 1970s and 1980s when Coors Brewing Company increased contracts for irrigated malt barley in the Big Horn Basin. Malting varieties accounted for

about 62 percent of barley production in 1985 (Torok, 1988). The share of barley to malting varieties increased to about 70 percent by 1999. A setback to production occurred in 1993 when Coors announced it would no longer be contracting in the Big Horn Basin due to stagnant demand for beer and new varieties, which increased yields in other contract areas. Malt barley is still grown in the Big Horn Basin and some is now grown in southeastern Wyoming. Average production information is shown in Table 8.

Figure 28. All wheat production, Wyoming (1925-2002).



(Data Source: Wyoming Agricultural Statistics, 2003)

Table 9. Winter wheat

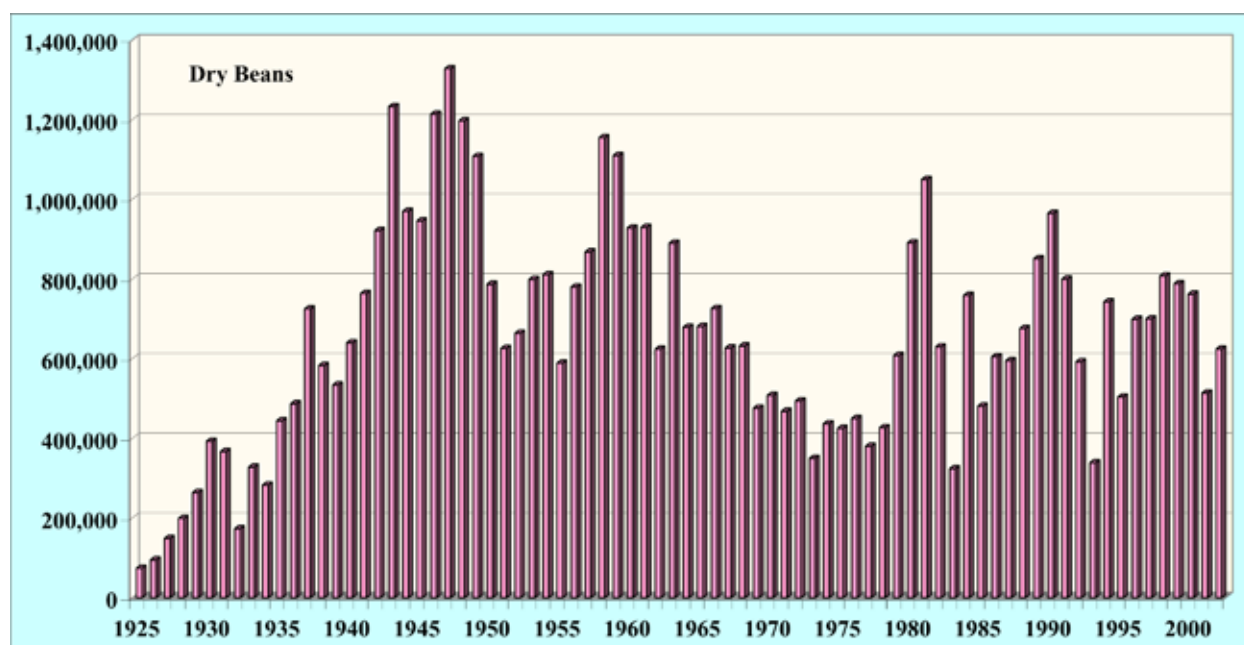
	1925-1934 Avg.	1993-2002 Avg.	Percent Change
Yield (bushels/acre)	12.96	27.60	112.96
Acres harvested	99,500	181,000	81.91
Production (bushels)	1,247,100	5,109,000	309.67

All Wheat

Wyoming was originally considered too dry for wheat production, but advances in dry land farming at the beginning of the twentieth century encouraged many people to try, sometimes with disastrous results. Drought during the Great Depression severely reduced yields and encouraged a rethinking of traditional production practices. One result was the shift away from spring wheat into winter wheat

varieties. Yields for both spring and winter wheat have more than doubled from their 1925 to 1934 averages, but acreage for spring wheat in Wyoming has been minimal since about 1960. Table 9 shows that average yield and acreage for winter wheat have doubled, and total production has more than tripled over the time period. Once again, drought conditions affected wheat production in the years 2000 to 2002.

Figure 29. Dry bean production, Wyoming (1925-2002).



(Data Source: Wyoming Agricultural Statistics, 2003)

Table 10. Dry beans

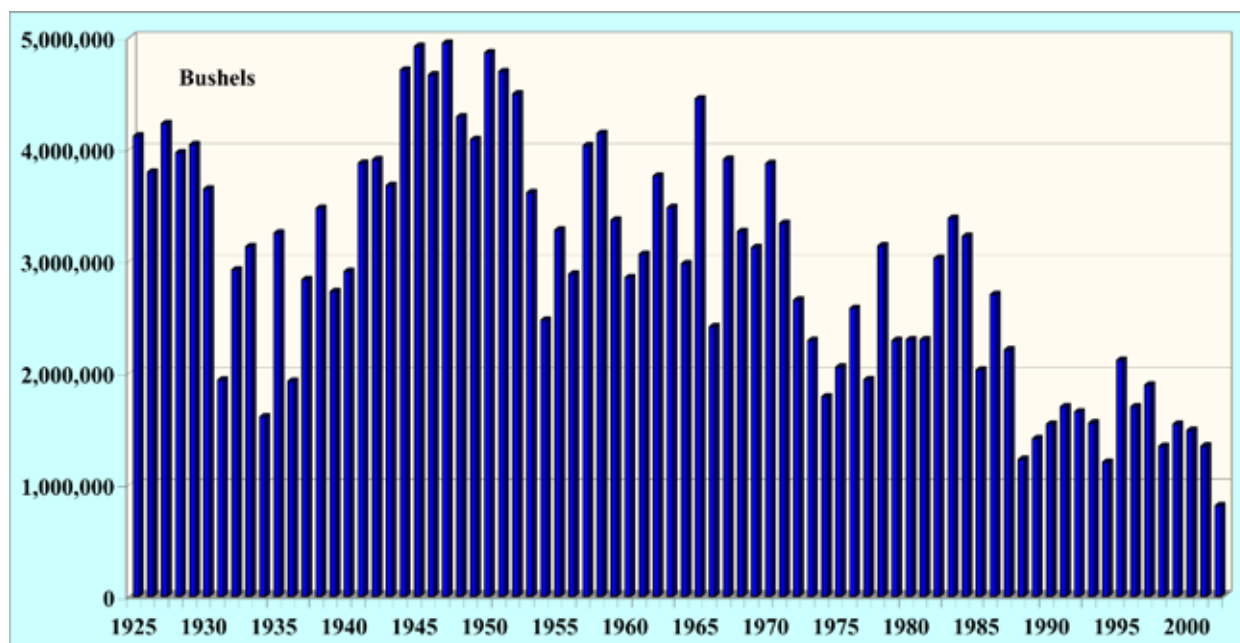
	1925-1934 Avg.	1993-2002 Avg.	Percent Change
Yield (cwt./acre)	8.73	20.25	131.99
Acres harvested	25,600	31,500	23.05
Production (cwt.)	232,500	648,100	178.75

Dry Beans

Dry bean production peaked in Wyoming during 1947 at 1,328,000 cwt. (Figure 29). Per capita dry bean consumption in the United States peaked two years earlier at 11 pounds per person per year. Per capita consumption trended downward until 1981.

Since then, consumption has trended upward, especially in the 1990s. A movement toward better nutrition, plus increased immigration, appears to be driving the trend in higher bean consumption (USDA, 2000). Average yield, acreage, and production for dry beans are shown in Table 10.

Figure 30. Oat production, Wyoming (1925-2002).



(Data Source: Wyoming Agricultural Statistics, 2003)

Table 11. Oats

	1925-1934 Avg.	1993-2002 Avg.	Percent Change
Yield (bushels/acre)	25.25	55.80	120.99
Acres harvested	132,000	26,800	-79.70
Production (bushels)	3,339,000	1,496,800	-55.17

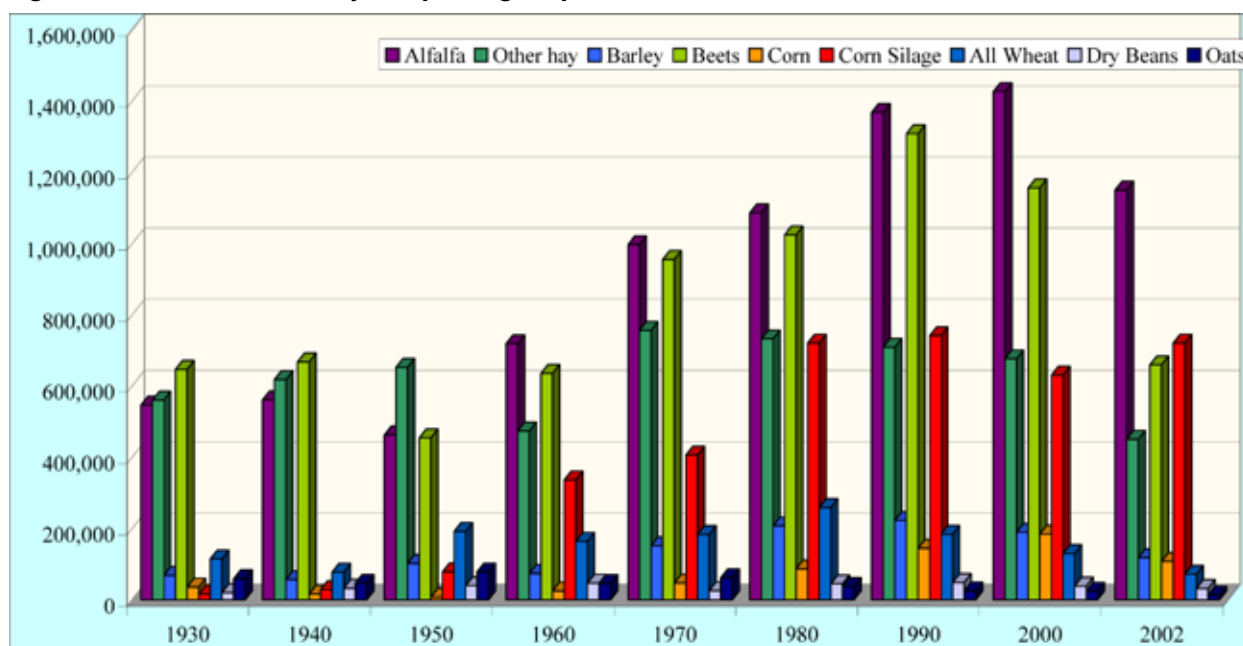
Oats

Oat production in Wyoming has been trending downward since the end of World War II (Figure 30). Typically, oats are used as a feedstock for cattle and horses. Table 11 shows that oats are one of the few commodities to decrease over the time period. The drop in oat production coincides with the increase in alfalfa production in the mid-1950s. Most likely, producers began substituting alfalfa for oats. Oat production appears to have achieved a base level, starting in 1990, with relatively stable produc-

tion levels occurring since then. 2002 production was likely affected by drought.

Although oats often are associated with horses, there is little correlation between horse numbers and oat production. The Wyoming agricultural horse population peaked in 1919 at about 225,000 and declined steadily until about 1960. Since then, the number of horses on Wyoming farms and ranches has fluctuated in a relatively narrow range of between 30,000 to 50,000 head.

Figure 31. Production of major Wyoming crops (1930-2002).



(Data Source: Wyoming Agricultural Statistics, 2003)

Level of Production

Figure 31 shows production for major crops in Wyoming at the start of each decade since 1930 (plus 2002). All production has been converted to tons to give a rough idea of the change in the level of production in the state. Clearly, from this aspect, farmers and ranchers are producing more than ever before. And since there are fewer producers (15,512 in 1925 versus 9,422 in 2002, USDA), productivity has increased significantly. Mechanization, the substitution of mechanical for human labor, is the chief reason for the change. Other significant contributions have come from the use of improved crop varieties, fertilizer, and more advanced agricultural practices.

Technology, Price Supports, and Globalization

Changes in agriculture during the twentieth century are the result of increases in technology in several areas. Mechanization is probably the most visible area, as agriculture moved from human power and horse-drawn equipment to large engine-driven farm machinery in less than 50 years. This unprecedented technological step is matched by the revolution in

hybridization that has dramatically increased yields during the last half of the twentieth century. In Wyoming, new varieties of alfalfa and corn have extended the distribution of these crops by shortening time to maturation, allowing them to be grown in most regions where sufficient water is available. Most other crops have had new varieties developed that are more disease resistant and drought or cold tolerant. Chemical fertilizers, pesticides, and herbicides also have improved significantly, and there is a promise of more to come as science peers down to the molecular level to study the workings of natural systems. Electronics, already pervasive on the farm, continue to impact every aspect of agriculture, allowing for advanced monitoring of soil, crops, livestock, and machinery for increased productivity.

Technological change increased crop yields and livestock productivity, allowing the percentage of the population engaged in providing society's food and fiber needs to drop from about 30 percent in 1920 to about 2 percent today. The surplus rural population moved to cities, which helped to fuel industrialization in the American economy. This socioeconomic ripple effect transformed and continues to impact the national economy.

As agricultural productivity increased, commodity surpluses resulted in price declines. Initially, government's solution was to install price supports to help the agricultural sector weather what were thought to be short-term problems with supply and demand. In actuality, these were structural shifts caused by the introduction of new technology (farm machinery). Once installed, price supports are politically difficult to remove. Price supports are typically aimed at grain farmers. Livestock producers are affected through their purchase of grain as a feedstock and through changes in market prices that reflect the level of grain stocks used by feeders. The following discussion puts price supports in a historical context to show how government involvement in production agriculture evolved and how it is related to the current situation with respect to global markets.

U.S. government support for farm prices has a relatively short history. The Federal Farm Board's (FFB) government-sponsored grain storage program was viewed as a temporary measure, resulting from the reduced demand of the Great Depression (The FFB was created by President Hoover in 1929). Additional price supports were instituted to deal with the emergency by various government entities throughout the 1930s. Federal programs continued through the war years to stimulate production in support of the war effort. Concerns of a post-war recession, similar to the early 1920s, led to the Farm Act of 1949, which allowed for price supports, marketing quotas, and acreage allotments. The Farm Act of 1949 is also important because it is the last permanent farm legislation to go into law. The farm bills currently in use are amendments to the 1949 act.

The effects of increased mechanization began to appear again as growing grain surpluses during the mid-1950s. Efforts to reduce the surplus through reduction of support programs were attempted for the next 20 years but met with heavy political resistance. Other methods to control surpluses, such as the removal of land from production, were tried with varying levels of success.

By the end of the 1960s, there was a growing consensus among policy makers that competitiveness in international markets was the solution to the surpluses. Yet the United States did not have a major influence on global markets due to price supports and fixed exchange rates, which effectively priced U.S. commodities out of the global market. A major step in the direction of market-oriented pricing occurred in 1972 when the Soviet Union decided to purchase large amounts of wheat due to a failed harvest. Coupled with the free floating U.S. dollar in world markets instituted in 1973, the Soviet grain sales served as an outlet for the surpluses and paved the way for U.S. farm policy to shift toward a free market solution. Since the early 1970s, farm policy has supported the market-oriented solution to agricultural commodity surpluses to varying degrees.

The movement away from support programs has increased volatility in farm income. Increased mechanization requires producers to borrow more to finance larger machinery. In addition, falling or stagnate crop and livestock prices have resulted in shrinking margins and the need for producers to borrow for additional land purchases in order to produce more. In the early 1980s, support programs for agricultural products were cut further in an effort to control government spending. As world market prices fell, U.S. producer's returns turned negative, resulting in the farm crisis. Many producers who had accumulated high levels of debt during the years of high exports in the 1970s failed. Producers who survived the farm crisis tended to have lower debt.

The decade of the 1990s was the beginning of the globalization of trade on a much larger scale. The collapse of the Soviet Union and its satellites paved the way for the opening of new markets worldwide. Asia, in particular, made significant gains as a net importer of agricultural commodities. The 1997 Asian financial crisis now appears to be a regionally limited problem in the global effort to liberalize trade agreements. Similar events are likely, however, as other developing nations confront problems dealing with trade and currency issues on an international level.

Outlook

Globalization's impact on production levels appears to be just beginning. Technology helped unlock production capacity in American agriculture, but globalization will unlock markets and allow producers to access demand worldwide. The danger is that weakened global demand, such as seen during the Asian financial crisis, will have a more direct impact on U.S. producers. Plus, competition from low-cost producers (such as Argentina and Australia in the beef market) will keep returns low.

Producers who are already under pressure from shrinking margins are likely to see the trend continue. Many challenges await traditional agriculture, and structural shifts that are underway will most likely continue the momentum.

New challenges in a more interconnected world include the threat of diseases such as brucellosis, BSE (Bovine Spongiform Encephalopathy) from imported cattle, and foot and mouth disease. Security threats are also new to producers in the form of bio- or agro-terrorism.

The long-term outlook seems to portend improvement in the agricultural sector, particularly in the area of exports. Demand worldwide is growing and export prices are strengthening. Current oversupplies in grain stocks are expected to shrink during the next few years. Incomes in developing countries are at lev-

els that consumers are starting to diversify their diets with more imported foods, especially meat (USDA, 2000). These indicators point to a stretching out of, if not movement away from, the cattle cycle as beef demand becomes more globally focused.

Mechanization and technology in general will continue to affect agricultural practices. Electronics and information technology (computers, wireless communications, global positioning system devices) are set to make the most inroads on the farm and ranch. Although there is concern about the use of bioengineered crops and livestock, advances in bioengineering are already finding their way onto the farm. To date, the rewards appear to outweigh the risks, but many producers are taking a wait-and-see attitude.

Wyoming agriculture is focused on livestock production and associated feed crops. There is no indication that this will change. The methods, markets, and the way the products are produced may change, but climate dictates that grazing will remain the principle agricultural activity for most of the state's land area.

For more information on trends in Wyoming agriculture or for downloadable copies of this and other publications, visit the Wyoming Economic Atlas at <http://Agecon.uwyo.edu/Econdev>.

References

- Foulke, Thomas, Roger Coupal and David T. Taylor. Trends in Wyoming Agriculture: Level of Production (1925-1999). University of Wyoming Cooperative Extension Service. MP-107. December 2000.
- Foulke, Thomas, Roger Coupal and David T. Taylor. Trends in Wyoming Agriculture: Agricultural Employment (1969-1997). University of Wyoming Cooperative Extension Service. MP-106. October 2000.
- Foulke, Thomas, Roger Coupal and David T. Taylor. Trends in Wyoming Agriculture: Size of Operation (1935-1997). University of Wyoming Cooperative Extension Service. MP-105. October 2000.
- Foulke, Thomas, Roger Coupal and David T. Taylor. Trends in Wyoming Agriculture: Agricultural Income (1959-1997). University of Wyoming Cooperative Extension Service. MP-104. July 2000.
- Foulke, Thomas, Roger Coupal and David T. Taylor. Trends in Wyoming Agriculture: The Changing Demographics of Wyoming's Agricultural Operators (1959-1997). University of Wyoming Cooperative Extension Service. MP-103. July 2000.
- Hoppe, Robert A. and Penni Korb. Farm Operator Household Income and Wealth Compare Favorably With All U.S. Households, Rural Conditions and Trends, Economic Research Service, U.S. Department of Agriculture, Vol. 8, No. 2, 1997, pages 79-85.
- Knutson, Ronald A., J. B. Penn, and William T. Boehm. Agricultural and Food Policy, Second Edition, 1990, Prentice-Hall Inc. Englewood Cliff, New Jersey.
- Layton, Stanford J. To No Privileged Class: The Rationalization of Homesteading and Rural Life in the Early Twentieth Century American West. The Charles Redd Center for Western Studies, Brigham Young University, Salt Lake City, Utah, 1988: 10-11, 21, 25, 28, 61-75, 79.
- Lindford, Velma. Wyoming: Frontier State. The Old West Publishing Company, Denver, Colorado, 1947: 230-234.
- MacDonald, James. "Concentration & Competition in the U.S. Food & Agricultural Industries." Agricultural Outlook, May 1999:1-2, 29.
- Rathge, Richard and Paula Highman. "Population Change in the Great Plains: A History of Slow Decline." Rural Development Perspectives, Vol. 13, No.1, United States Department of Agriculture, 1998:19-27.
- Torok, Steven J. Wyoming Barley Industry: Background Information and Assessing the Potential for Value-Added Opportunities, University of Wyoming Cooperative Extension Service Bulletin, B-898.2 (1988).
- United States Department of Agriculture, Economic Research Service, Situation and Outlook Report: Agricultural Income and Finance, AIS-73, December, 1999:17.
- United States Department of Agriculture, Economic Research Service, <http://www.ers.usda.gov/whatsnew/issuesconcentration/index.htm>, Concentration and Structural Change in U.S. Agriculture, October, 1999:1.
- United States Department of Agriculture, National Agricultural Statistics Service, 1997 Census of Agriculture, Volume 1, Geographic Area Series Part 50, AC97-A-50, March, 1999:vii.
- United States Department of Agriculture, National Agricultural Statistics Service, 2002 Census of Agriculture, Volume 1, Geographic Area Series Part 50, AC-02-A-50, June, 2004.
- United States Department of Commerce, Census Bureau, <http://www.census.gov>, Population Estimates, by State 1990-1999.
- United States Department of Commerce, Economics and Statistics Administration, Bureau of the Census, 1992, 1987, 1982, 1974, 1969, 1964, 1959 Census of Agriculture, Volume 1, Geographic Area Series Part 50.

- United States Department of Agriculture, Economic Research Service. Structural and Financial Characteristics of Family Farms: 2004 Family Farm report. Edited by David E. Banker and James M. MacDonald, AIB-797, USDA, Economic Research Service, March 2005.
- United States Department of Agriculture, Economic Research Service. U.S. Export Performance in Agricultural Markets, Technical Bulletin No. TB-1854, 1997:8-9.
- United States Department of Agriculture, Economics, Statistics and Cooperatives Service. Developments in Marketing Spreads for Food Products in 1979, Agricultural Economic Report No. 449.1980:33.
- United States Department of Agriculture, Statistical Reporting Service. Cattle Reports: A Handbook on Surveying and Estimating Procedures, ESS-13, July 1981.26-29.
- United States Department of Agriculture Economic Research Service. Agricultural Research, Productivity and Technical Change. Online summary report.
- United States Department of Agriculture Economic Research Service. "Farm Income Briefing Room," Agriculture Fact Book 98, Internet site: <http://www.econ.ag.gov/briefing/farmincome/finfidmu.htm>.
- United States Department of Agriculture Economic Research Service. "Forces Shaping U.S. Agriculture Briefing Room," Internet site: <http://www.econ.ag.gov/Briefing/forces/>.
- United States Department of Agriculture Economic Research Service. "World Meat Trade Shaped by Regional Preferences and Reduced Barriers," Agricultural Outlook, March 2000:7-9.
- United States Department of Agriculture Economic Research Service, "Global Trade and International Issues Shape Long-term Outlook for U.S. Agriculture," Agricultural Outlook, April 2000:5-6.
- Wyoming Department of Employment and Department of Administration and Information Economic Analysis Division. Outlook 2000: Joint Economic & Demographic Forecast to 2008. February 2000:6-7.
- Wyoming Agricultural Statistics Service. Wyoming Agricultural Statistics, Cheyenne, Wyoming. 1923-2003.

