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Wheat Production and Management Practices used by Oklahoma Grain and Livestock Producers

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Ishrat Hossain
Graduate Student, Agricultural Economics

Francis M. Epplin
Professor, Commercial Agriculture, Agricultural Economics

Gerald W. Horn
Professor, Forage Utilization, Animal Science

Eugene G. Krenzer, Jr.
Professor, Extension Wheat Specialists, Plant and Soil Sciences

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Introduction

More than six million acres of Oklahoma cropland are seeded annually to winter wheat. As a result of the soil, climate, and environmental conditions, the Southern Great Plains region has a unique niche enabling the production of winter wheat for three purposes: (1) grain-only, (2) forage-only, and as a (3) dual-purpose forage and grain crop (Krenzer, 1994). In the Southern Great Plains, the risk of severe Hessian fly infestations is small. This enables producers the option to plant wheat in late summer, which extends the fall vegetative growth period and increases fall forage production relative to October plantings. Extended snow cover is rare, enabling livestock to graze during the winter.

Wheat forage is of high nutritive value and gain potential of livestock is excellent. In a forage-only system, forage is available in late fall, winter, and early spring, when other forage sources are low in quantity and quality. In a dual-purpose system, wheat forage is available for grazing by livestock from mid-November until development of the first hollow stem, usually in early March. Typical rainfall patterns in April and May reduce concern about soil moisture limiting potential grain production (Krenzer, 2000a). If livestock are removed no later than the development of first hollow stem, the wheat will mature and produce a grain crop for harvest in June.

Many lightweight calves are brought in from the Southeast, Midwest, and West to graze on wheat pasture in the Southern Plains (Brorsen et al., 1994). After wintering on wheat pasture, these calves are fed to slaughter weight in Southern Plains feedlots. The use of winter wheat as a multi-purpose crop is important in the agricultural economies of southwestern Kansas, eastern New Mexico, western Oklahoma, southeastern Colorado, and the Texas Panhandle (Epplin et al., 2000; Pinchak et al., 1996; Redmon et al., 1995; Shroyer et al., 1993).

The United States Department of Agriculture (USDA) provides annual estimates of the wheat acres planted and harvested for grain (National Agricultural Statistics Service, 2003). However, they do not differentiate among wheat uses. Hence, there are no routine data available from the USDA on the proportion of wheat acres used for each of the three purposes. Similarly, estimates of the number and class of animals stocked on wheat pasture in Oklahoma are also not provided by the USDA.

Recommended research-based wheat production practices differ across intended use. For example, the recommended planting date for wheat that is intended for forage production is two to six weeks before the recommended planting date for grain-only production. The recommended seeding rate is also greater for forage-only wheat (Krenzer, 2000b). The optimal level of fertilizer may also differ across intended use of wheat. However, since the USDA's wheat cropping practices survey does not differentiate among the three uses, little information on actual production practices is available.

Surveys of selected Oklahoma wheat producers were conducted by Harwell et al. (1976) and Walker et al. (1988). Participants provided information on wheat and wheat pasture stocker management practices. However, neither of these surveys was drawn from a representative sample of wheat producers. Hence, the data could not be used to conduct hypothesis tests regarding differences in production practices across intended use. Results of a 1996 random survey of Oklahoma wheat producers were reported by True et al. (2001). However, for most of the state, a drought extended throughout the 1995-96 growing season and fall and winter forage production was abnormally low. True et al. (2001) recommended an additional survey to verify and augment their findings.

Objectives

The overall objective of this study was to provide information about production methods, management practices, and lease arrangements used by Oklahoma wheat, wheat pasture, and wheat pasture livestock producers. The specific objectives were to (1) determine the proportion of wheat grown for each of the three purposes (grain-only, forage-only, and dual-purpose), and determine if production practices differ across intended use; (2) determine production methods and management practices used by Oklahoma wheat, wheat pasture, and wheat pasture livestock producers; (3) determine characteristics of wheat pasture lease arrangements; and (4) to compare selected responses from the 2000 survey to those of the 1996 survey of Oklahoma wheat, wheat pasture, and wheat pasture livestock producers.

The information obtained from this research may be used to compare actual practices used by producers to recommended practices, to identify research and extension program needs, and to target extension programs to practices that deviate substantially from research-based recommendations.

Methods

A four-page questionnaire was mailed to a randomly selected group of Oklahoma wheat producers in March of 2000. A panel from the Oklahoma State University Departments of Animal Science, Plant and Soil Sciences, and Agricultural Economics designed the survey questions. Agricultural statisticians of the Oklahoma Agricultural Statistics Service (OASS) cooperated in making the final edit of the questionnaire form. A copy of the questionnaire is included in the Appendix (page 33). Budget constraints dictated the use of a mail questionnaire rather than face-to-face or phone interviews.

The questionnaire included open-ended, ranking, and multiple-choice items. To minimize item non-response, few open-ended questions were used. Pretesting was limited to administering the questionnaire to several graduate students who were from Oklahoma and had wheat and stocker production experience.

The Oklahoma Agricultural Statistics Service (OASS) maintains a database that includes names and addresses of Oklahoma crop and livestock producers including those that produce wheat. The survey used the most recent database constructed initially from information obtained from the 1997 census of agriculture. OASS routinely updates the database using information gathered during their regular data acquisition program.

A stratified sampling plan was used. The state was divided into six regions (Figure 1 page 17) to account for the variability of practices due to weather and soil in different parts of Oklahoma. Five of these regions correspond with Oklahoma crop reporting districts – Panhandle, West Central, Southwest, North Central, and Central. The sixth region (South Central – East) includes the four remaining crop-reporting districts – South Central, Northeast, East Central, and Southeast. The OASS database was divided into six strata corresponding to the six regions as specified.

A total of 4,815 producers were randomly selected from the database, approximately 800 from each of the six regions. Consistent with federal policy, access to the OASS database is restricted to OASS statisticians. Hence, OASS selected the sample and addressed and mailed the questionnaires. The questionnaire was mailed on March 9, 2000. OASS mailed reminder postcards on March 15, 2000. A copy of the reminder postcard is included in the Appendix.

A total of 1,204 (25%) questionnaires were returned. However, 114 questionnaires did not contain useful information. Data from 1,090 were analyzed. More than 160 usable responses were received from each of the six regions (Table 1 page 17). The 1,090 respondents reported that they had planted 460,997 acres to wheat in the fall of 1999. This was approximately 8% of the total Oklahoma acres of 6.1 million planted for all wheat purposes in the 1999-2000 crop year.

The response data were entered into a database and findings were summarized into tables. Multiple mean comparison procedures were used to conduct hypothesis tests regarding relevant production practice differences across intended use within each region. Some results were compared to those obtained from the 1996 survey of Oklahoma wheat producers (True et al., 2001).

Weather

Average precipitation decreases from Southeast to Northwest in Oklahoma (Tables 2 and 3 pages 17 and 18). The state average annual precipitation in 1999 was 37.88 inches, 1.33 inches greater than the mean of 1971-2000 (Table 2). Though the first half of the year was wetter than normal, the second half was drier. The statewide average annual temperature was 61.4 degrees Fahrenheit, 1.3 degrees above the mean of 1971-2000 (Table 4 page 18). The second half of the year was also warmer than normal.

Table 2 also includes the 1999 average precipitation by Oklahoma region by month (July-December). Each region had significantly lower than normal precipitation in July and August of 1999. As a result of rainfall during the second week of September, the situation improved across some regions. In October, the dry weather was again widespread except in the Panhandle and Southwest regions. Exceptionally dry and warm weather was present throughout the state in November. It was followed by mild weather in December, when on average almost all regions had higher than normal precipitation.

The statewide average annual temperature was 60.4 degrees in 2000, close to the normal (Table 4). Though the statewide average annual precipitation was above normal in 2000, the year began rather dry (Table 3). Overall, mild temperatures and good spring rainfall helped wheat growth and development. The year included one of the wettest months of March on record (Oklahoma Climatological Survey, 2001). Excellent growing weather in March and April helped to improve wheat conditions across the state. Almost the entire wheat crop had jointed by the end of April. Despite the abnormally wet conditions in June, wheat grain harvest was completed earlier than normal (Oklahoma Agricultural Statistics Service, 2001b).

Survey Findings

Farmland was defined to include cropland, pastureland, woodland, CRP, and other land. The survey found that the total number of acres in the state is approximately equally divided between owned and leased. But, fewer respondents reported leasing land compared to those who reported owned acres. Therefore, the average size leased was greater than the average size owned (Table 5 page 18). On average, producers owned 651 acres and leased 835 acres.

The largest farms are in the Panhandle region and smallest ones are in the South Central-East region.

Membership in Organizations

Respondents were asked if they were members of either the Oklahoma Wheat Growers Association (OWGA), or the Oklahoma Grain and Stocker Producers (OGSP), or the Oklahoma Cattlemen's Association (OCA). Most of the respondents (66%) indicated that they did not belong to any of the three associations (Table 6 page 19). Statewide, membership percentages were 11% in OWGA-only, 0% in OGSP-only, 14% in OCA-only, 0% in both OWGA and OGSP, 7% in both OWGA and OCA, 0% in both OGSP and OCA, and 1% in all three. The proportion of the members' wheat acreage with respect to the total planted wheat acres were also calculated and included in Table 6. Members of OCA-only planted 17% of the total wheat acreage, whereas members of the OWGA-only planted 11% of the total wheat acreage.

In a related table, the respondents were divided into three categories: grain-only, forage-only, and forage and grain (Table 7 page 19). The grain-only category included producers who planted wheat intended only for grain, forage-only included producers who planted wheat intended only for forage, and the forage and grain category included producers who intended to use their wheat to produce both fall-winter forage and grain. As expected, in the grain-only category, more producers (18%) were members of OWGA-only and few (6%) were OCA-only members. In the same manner, 17% of the producers in the forage-only category were members of OCA-only, and only 3% were members of OWGA-only. In the forage and grain category, 12% were OWGA-only members, 16% were OCA-only members, and 9% were members of both OWGA and OCA.

Other Crops with Wheat

Producers may plant other species, such as rye or ryegrass, with wheat. This may be done in an attempt to produce more forage or to increase the length of the grazing season. When mixed with wheat, rye can improve early fall grazing and annual ryegrass can extend the spring graze-out period. However, both rye and ryegrass can become serious weed problems for future wheat crops in the same field. Producers who follow this practice are encouraged to destroy the rye and ryegrass after grazing to prevent seed production.

When asked whether they had planted any other species with the wheat, 13% of the respondents in the state answered in the positive (Table 8 page 20). This ranged from 3% in the Panhandle to 31% in South Central-East region. About 4% of the state's planted wheat acreage included a species in addition to wheat. The combination percentage was greatest in the South Central-East region (16%) and least in the North Central region (1%).

Soil Testing

Good nutrient management is essential for maintaining fertile and productive soils. Soil testing is recommended to identify nutrient deficiencies and is the most reliable guide to develop an efficient fertilization strategy (Krenzer, 1994). Nitrogen and phosphorus are the nutrients of concern for most Oklahoma wheat acres. The availability of phosphorus is greatly affected by soil pH. Soil testing every three years is recommended to check the levels of pH, phosphorus, and potassium (Johnson et al., 2000). Of the respondents in the state as a whole, 60% reported that they test soil at least once every three years (Table 9 page 20). However, 37% responded that they seldom or never have their soil tested. About 48% of respondents in the Panhandle region seldom or never have their soil tested. The percentages in other regions were similar to the state percentages.

Definition of "First Hollow Stem"

Research has found that grazing wheat beyond the first hollow stem growth stage substantially decreases grain yield (Redmon et al., 1995). Therefore, the ability to identify the first hollow stem growth stage is very important for dual-purpose wheat producers. This is the stage when the stems begin to elongate or hollow stem is forming just above the roots (Krenzer, 1994).

A question was included to determine how familiar producers were with the term "first hollow stem" in reference to wheat growth stages. The choices were: joint or node above the soil surface; developing head is at or above the soil surface; hollow stem can first be identified above the roots; and not familiar. The respondents were categorized into three groups: grain-only, forage-only, and dual-purpose. Under the grain-only category, those producers who intended to use all of their acreage for the purpose of grain-only were included. Similarly, producers who reported no use other than forage were included in the forage-only category. Producers who had at least some proportion of their acreage for dual-purpose were included in the dual-purpose category. Producers in the dual-purpose category are most likely to benefit from the ability to identify the "first hollow stem" growth stage, so that they may terminate grazing of dual-purpose wheat at the appropriate time.

As reported in Table 10 (page 20), 36% of the respondents in the dual-purpose category selected the correct identification of first hollow stem. Proportionately fewer producers in the grain-only (24%) and forage-only (21%) categories identified the correct response. In the dual-purpose category, the most correct responses (44%) were received from the North Central region the and least (27%) from the Panhandle region.

Wheat Variety Selection

Variety selection is an important management decision. Some characteristics that may be used to select wheat varieties were listed in the survey. Respondents were asked to rank in order of importance the top three characteristics that they used to select varieties. Producers ranked grain yield and forage yield as the two most important variety characteristics in every region (Table 11 page 21). Statewide, grain yield received 44% of the number one (most important) ranks, 22% of the number two ranks, and 8% of the number three ranks. Forage yield received 38%, 19%, and 8% of the one, two, and three ranks, respectively. In the Central and South Central-East regions, forage yield was ranked more important than grain yield. Producers also cited grain yield and forage yield as primary factors in the 1996 (True et al., 2001) and 1988 surveys (Walker et al., 1988). Other important characteristics identified in this survey were past success, test weight, and drought tolerance. Winter hardiness was also noted as an important characteristic in both the Panhandle and South Central-East regions.

In a related question, producers were asked to rank sources of information as to their importance for variety selection. Producers rely on various sources for their information, since it is impossible for them to individually test all varieties on their farm. As in the 1996 survey (True et al., 2001), past performance on their farm was identified as the most popular variety information source across all regions (Table 12 page 21). Statewide, 51% of the producers checked past performance as the number one source. Extension test plot results (48% checked as either first, second, or third) and results in neighboring fields (11% checked as first) were also popular sources of information. Among the other listed choices, seed availability was considered important, especially in the Central and South Central-East regions.

Intended Use

Statewide, the response to the question, "How many of your 1999-2000 wheat acres were planted for each purpose," was 31% for grain-only, 20% for forage-only, and 49% for dual-purpose (Table 13 page 22). The North Central (46%) and Panhandle (45%) regions had the greatest percentages intended for grain-only. The West Central (16%) and Central (16%) regions had the least percentages intended for grain-only. The greatest percentage (49%) of acreage intended for forage-only was in the South Central-East region, typically the region with greatest rainfall. The region with the least amount of rainfall, Panhandle, had one of the least percentages (10%) of acreage intended for forage-only. In the West Central region, 61% of the acreage was intended for dual-purpose use.

Actual Use

The responses to the question, "How many acres of your 1999-2000 wheat crop will actually be used for each purpose," were summarized in Table 14 (page 22). Actual use may differ from intended use for various reasons, especially due to weather circumstances. Since both grain yield and forage yield are affected by planting dates (Epplin et al., 2000), wheat should be planted at the appropriate time for the desirable intention. When the weather is not favorable for planting during the intended planting date window, producers may be forced to change planting date and actual use of wheat may differ from the original intended use. Sometimes unfavorable weather, such as drought, severe cold, or rain, after the planting or during the production season may force producers to modify plans.

Statewide, 39% was used for grain-only, 22% for forage-only, and 39% for dual-purpose. The percentage (22%) of wheat acreage actually used for forage-only changed very little from the original intention (20%). The main differences were in grain-only and dual-purpose. Producers reported that they had intended to use 31% for grain-only and 49% for dual-purpose, but ended up actually using 39% for grain-only and 39% for dual-purpose. The major differences between the intention and actual usage were in the West Central, Panhandle, and Southwest regions. One of the reasons might be that the July, August, September, and October precipitation levels in the Southwest and West Central regions were below average (Table 2). This may have reduced fall production of wheat forage relative to expectations. In which case some wheat intended for dual-purpose was used for grain-only.

In the 1996 survey, only 9% of the wheat acreage was intended for forage-only compared with 20% in this survey (Table 15 page 22). This major change was very likely a response to changes included in the 1996 Federal Agriculture Improvement and Reform (FAIR) Act. At the time of the 1996 survey, farmers were operating under a federal policy that often required wheat grain harvest on a large proportion of the acres planted to maintain wheat program base acres. Since federal payments were tied to wheat program base acres, producers were very reluctant to engage in practices that may have jeopardized wheat program base acres. However, under the 1996 act, producers were given greater flexibility. They were permitted to use wheat base acres to produce forage and still collect federal payments based upon their historical wheat base acres and wheat base grain yield. In addition, use of the land to produce forage did not jeopardize their wheat base acres. Another contributing factor to the relative decrease in acres intended for wheat grain in the 1999-2000 survey was that the 1999 average market year price of $2.24 per bushel of wheat was the lowest in decades (National Agricultural Statistics Service, 2003).

Diversification

Producers may diversify to manage production risks and reduce income variability. Wheat producers can diversify by using a combination of cropping systems on their cropland. The majority (61%) of respondents reported that they intended to grow wheat for more than one purpose (Table 16 page 22). However, 39% intended to use all of their wheat acreage for just one purpose, 19% for grain-only and 20% for forage-only. Dual-purpose is considered to be a multiple activity and 27% indicated dual-purpose only. Other potential combinations were forage-only and dual-purpose (12%); grain-only and dual-purpose (8%); grain-only, forage-only, and dual-purpose (7%), and grain-only and forage-only (6%). The West Central region had the greatest percentage (76%) and South Central-East region had the least percentage (26%) of producers who intended to grow wheat for more than one purpose.

Production Practices across Intended Use of Wheat Acreage

Wheat producers may vary production practices with intended use. Multiple pairwise comparisons of the means associated with each of the three purposes within each region were conducted using the Tukey method (Kuehl, 2000; SAS Institute, 1999a). State averages of selected responses in this survey were compared with state averages obtained from the 1996 survey (True et al., 2001) to the same or a very similar question to determine if the respective averages were statistically different from each other. For example, in the case of seeding rate, the grain-only averages of the two surveys were compared, the forage-only averages of the two surveys were compared, and the dual-purpose averages of the two surveys were compared. Assuming that the surveys were independent of each other, the data were normally distributed in each group, and the variances of the respective two groups were equal, it is appropriate to use a *t* test to compare the two means (SAS Institute, 1999b; Wackerly et al., 1996). All mean comparison tests were done at the 5% level of significance using SAS.

Seeding Rate

Statewide, respondents reported the greatest seeding rate of 94 lb/acre for wheat intended for forage-only (Table 17 page 23). The seeding rate for wheat intended for grain-only was 77 lb/acre and the seeding rate for wheat intended for dual-purpose was 84 lb/acre. These rates are consistent with recommendations in the sense that a greater seeding rate is recommended for wheat that is intended for forage relative to wheat intended for grain-only. However, the reported forage-only and dual-purpose rates were lower than rates recommended by state extension specialists (Krenzer, 2000c; Shroyer et al., 1993).

The Tukey test revealed that the forage-only average seeding rate was significantly greater than the seeding rates of both grain-only and dual-purpose. The seeding rate for dual-purpose production was significantly greater than that for grain-only.

When comparing state averages across the two surveys (Table 18 page 23), the *t* test found that the grain-only seeding rate average of 72 lb/acre in 1996 survey was significantly different than the grain-only average of 77 lb/acre in this survey. Similarly, the forage-only average of 90 lb/acre in 1996 survey was significantly different than the 94 lb/acre reported in this survey, and the dual-purpose average of 79 lb/acre in 1996 survey was also significantly different from the 84 lb/acre reported in this survey. Based upon these findings the average seeding rate increased by 4 to 5 pounds per acre from the fall of 1995 to the fall of 1999 across all three intended uses. These increases in seeding rates are consistent with research-based recommendations.

Table 17 also includes the reported average seeding rates across intended use by region. The least averages occurred in the Panhandle region, and the greatest averages occurred in the South Central-East region. This was similar to findings from the 1996 survey. Producers in the greater rainfall areas use greater seeding rates. Forage-only seeding rate averages were always the greatest among the three averages within each region. Grain-only averages were significantly lower than the respective forage-only averages in all the regions. Grain-only averages were also significantly lower than the respective dual-purpose averages in all regions except the Central region. However, the difference between the forage-only and dual-purpose averages was significant only in the Panhandle and Central regions.

Planting Date

When asked to report the target and actual fall 1999 wheat planting dates, the respondents often recorded a range of dates for each category. In those cases, the middle date of the range was used for the analysis. The reported average target planting dates show that producers consistently planted forage-only wheat earliest, then dual-purpose wheat, followed by grain-only wheat (Table 19 page 23).

The state average wheat target planting dates were significantly different across intended use (Table 19). The average target planting date of October 2 for grain-only was significantly later than both forage-only and dual-purpose averages. The average dual-purpose target planting date of September 20 was significantly later than the average forage-only target planting date of September 13. These averages were found to be significantly different from the respective 1995-96 grain-only average of September 27, forage-only average of September 10, and dual-purpose average of September 17 (Table 18). Average grain-only target planting date was significantly later than forage-only and dual-purpose averages in all regions. The difference between forage-only and dual-purpose averages was significant only in the West Central, North Central, and Central regions.

The average responses to the question of actual planting date (Table 20 page 24) were later than the average target planting dates. Respondents on average planted wheat intended for grain-only the second week of October. Wheat intended for forage-only was planted during the fourth week of September, and dual-purpose wheat in late September or early October. Statewide, average grain-only actual planting date was significantly later than both forage-only and dual-purpose averages, and average dual-purpose actual planting date was significantly later than the forage-only average. The 1996 actual planting date state averages were October 7 for grain-only, September 23 for forage-only and October 1 for dual-purpose. Within each region, in comparison to those of target planting dates there are fewer significant differences between the average actual planting dates. The latest average actual planting date (October 16) was for grain-only wheat in the Southwest region, and the earliest one (September 21) was for forage-only wheat in the South Central-East region.

Nitrogen Fertilizer

Soil fertility plays a major role in wheat production. Nitrogen is usually the most limiting nutrient associated with wheat forage production (Shroyer et al., 1993). Available nitrogen changes in the soil mainly as a result of the amount of nitrogen removed in forage and grain harvest relative to the amount added. Nitrogen requirements can be calculated based on expected yields. It is estimated that 1,000 pounds of dry forage requires 30 pounds of nitrogen and each bushel of grain requires two pounds of nitrogen (Krenzer, 1994). For an expected grain yield of 35 bushels per acre in a grain-only enterprise, an expected forage yield of 5,000 pounds of dry forage per acre in a forage-only enterprise, and 2,000 pounds of forage and 30 bushels of grain per acre in the dual-purpose enterprise, the recommended nitrogen requirements per acre will be approximately 70 pounds, 150 pounds, and 120 pounds for grain-only, forage-only, and dual-purpose wheat enterprises, respectively. These quantities are based upon the assumption that no nitrogen is available from other sources such as breakdown of organic matter, and that none of the nitrogen consumed by the livestock that is returned to the soil in the form of urine and feces is available for use by the plant.

Table 21 (page 24) includes a summary of the actual nitrogen used across regions. All reported forage-only and dual-purpose nitrogen uses were lower than the recommendations by a large margin. This suggests that (1) farmers applied an insufficient quantity of nitrogen, (2) farmers expected that the soil contained a substantial quantity of residual nitrogen, or (3) the recommendation relative to nitrogen requirements for livestock production on grazing wheat is incorrect. It could be that the quantity of nitrogen returned to the field in the form of urine and feces is substantial and that its value is underestimated. Current nitrogen recommendations relative to forage production and use by livestock were derived from wheat plots that were clipped rather than grazed. Additional research may be needed to more precisely determine forage and livestock response to nitrogen on plots that are actually grazed.

In the state as a whole, though the grain-only average of 63 lb/acre was significantly lower than both forage-only and dual-purpose averages of 69 lb/acre, the differences were not large. The averages in 1996 were 66 for grain-only, 78 for forage-only, and 70 for dual-purpose (Table 18). Only the forage-only *t* test showed the actual average nitrogen applied was significantly different from that reported in the 1996 survey. In the regional analysis, the reported averages were not significantly different from each other except in the Panhandle region (Table 21). In the Panhandle, the grain-only average was significantly lower than the dual-purpose average, but other averages were not significantly different from each other. The greatest reported average actual nitrogen use was for the wheat intended for dual-purpose in the South Central-East region, and the least was for the wheat intended for grain-only in the Panhandle region.

Fall and Winter Grazing Practices

Approximately 90% of the respondents in every region, who checked at least one livestock type for question 14 of the survey, grazed either stocker cattle or cows and/or replacement heifers on 1999-2000 wheat pasture (Table 22 page 24). This response was similar to that reported in the 1996 survey. Other than the combination of stocker cattle and cows and/or replacement heifers, almost all other responses were checked as only one species. The responses for the state as a whole were 42% for stocker cattle, 22% for cows and/or replacement heifers, 28% for both stocker cattle and cows and/or replacement heifers, 1% for sheep, 2% for dairy cattle, 3% for horses, and 1% for other. Stocker cattle had the greatest percentages in all regions except in the West Central region, where most respondents (38%) checked both stocker cattle and cows and/or replacement heifers. This combination was also high (34%) in the Southwest region.

The survey results and OASS reports were used to estimate the number of stocker steers and stocker heifers grazed on 1999-2000 wheat pasture (Tables 23 and 24 page 25). Column one of Tables 23 and 24 contains the estimate of wheat acres in the regions provided by the OASS (2001c). Column two contains the percentages of wheat acres used for either forage-only or dual-purpose as reported in Table 14. Column three is the multiplication of the first two columns and provides an estimate of the total wheat acres used for forage in each region.

Column four of Table 23 was derived from the survey results as follows. Respondents who checked stocker steers in survey question 15, were divided into two groups. One group of respondents had only stocker steers in their 1999-2000 fall-winter operation. The other group had steers in combination with other species of livestock. It was assumed that the first group used all of their forage-only and dual-purpose acreage to graze steers and the second group used half of their forage-only and dual-purpose acreage to graze steers. Those two groups of acres were added and divided by the sum of all forage-only and dual-purpose acres in each region. The result is reported in column four of Table 23. Column four of Table 24 was calculated in a similar manner.

Multiplication of columns three (total acres) by four (percent used by stockers) resulted in column five (an estimate of the total wheat acres stocked with steers). Column six, the stocking rate, is also reported in Table 25 (page 25). Dividing column five (acres) by column six (stocking rate) results in column seven (the estimated number of steers in the state stock on wheat pasture during the 1999-2000 wheat production year). By this measure, there were an estimated 886,351 stocker steers (Table 23) and 466,136 stocker heifers (Table 24) on Oklahoma wheat pasture. The Panhandle and the South Central-East regions had the least number of steers and heifers. The Panhandle, the region with the least number of stockers (60,134 steers and 36,814 heifers), had the least number of wheat acres used for forage and lowest stocking rates. On the other hand the North Central region had the greatest number of steers (212,051) and heifers (111,390), and the greatest number of wheat acres used for forage and one of the greatest percentages of forage acres used by steers and heifers.

Table 25 includes average beginning weight, rate of gain, and stocking rates for steers and heifers, and stocking rates for cows. The state average for beginning weight was 460 lb for stocker steers and 447 lb for stocker heifers. The North Central region had the greatest averages, 479 lb for steers and 466 lb for heifers. The West Central region had the least average beginning weight of 430 lb for heifers. The averages for heifers in other regions were close to the state average. The least average beginning weight for steers was 436 lb in the South Central-East region.

On average, the reported rate of gain for steers was greater than the rate of gain for heifers across all regions. The reported state averages were 2.3 lb/day for steers and 2.1 lb/day for heifers. Almost all regions reported gains over 2.0 lb/day.

Stocking rates vary from year-to-year and region-to-region depending upon climatic and management factors that influence wheat forage production. The state stocking rate averages were 2.1 acres/steer and 2.0 acres/heifer. Other statewide stocking rate averages were 3.5 acres/head for cows with fall calves, 3.3 acres/head for cows with spring calves, and 2.9 acres/head for cows only. The reported stocking rates varied across regions. The South Central-East and Central regions reported the greatest stocking rates and the Panhandle, the region with least rainfall, reported the least stocking rates. The North Central region reported a relatively low stocking rate perhaps because it had the greatest average beginning weights for steers and heifers.

Purchase of Stockers

Many respondents, who purchased stocker cattle for fall-winter grazing, purchased animals in more than one month (Table 26 page 26). For example, statewide 6% of the respondents checked October, November, and December as the months they purchased stocker cattle. Twenty-seven percent of respondents chose a combination of months (July to December) that was not reported in the Table 26. October (15%) and November (14%) were the most popular months among the producers who checked only one month. Seven percent of the respondents purchased stocker cattle in months other than July to December.

Forty-two percent of the stocker cattle producers reported that they usually mass medicate stockers with an antibiotic after purchase and before placement on wheat (Table 27 page 26). The response percentages were similar across regions. Almost half (49%) of the Southwest region respondents reported that they mass medicated, whereas 38% of those in the South Central-East region did.

In response to the question, "How many days do you typically have purchased stockers on the farm before placing them on wheat," the state average was 26 days (Table 28 page 26). The greatest average (31 days) was reported in the Panhandle region and the least average (23 days) was in the Central region.

Receiving Programs

The receiving period is one of the most stressful times during an animal's life (Lalman and Gill, 1997). Many producers follow a receiving program for purchased stocker cattle or buy them pre-conditioned before placing them on wheat pasture. In the state as a whole, among the respondents who checked at least one of the four choices in question 18 of the survey, 21% used their own receiving diet, 23% used a commercial diet, 8% purchased cattle pre-conditioned, and 48% did not use a receiving diet (Table 29 page 26). A receiving diet, own or commercial, was most common (55%) in the North Central region and least common in the South Central-East where 57% reported not using a receiving diet. Purchasing pre-conditioned cattle was most common (16%) in the Southwest region.

Table 30 (page 26) includes a summary of days and cost of the receiving diets. The statewide averages were 23 days at $12/head for producers who used their own receiving program, and 20 days at $15/head for a commercial program. Some of the regional averages might be unreliable due to a limited number of responses.

Grass hay was the most frequent feedstuff used by producers who used their own receiving program (Table 31 page 27). The three most commonly used programs in the state included grass hay. They were grass hay plus a high-protein supplement (27%), grass hay plus a high-energy supplement (22%), and grass hay alone (16%). Those three programs were mostly used (79%) in the South Central-East region and least used (49%) in the Panhandle region. A complete mixed ration (hand-fed daily) was also popular (19%) in the Panhandle.

Grazing Initiation and Termination

Krenzer (1994) recommended that grazing should not begin until wheat has developed a coronal root system. The coronal root system, also called secondary root system, anchors the plant, which makes it difficult for grazing animals to uproot it. Furthermore, future growth is not critically affected by leaf removal after this growth stage. In response to the question, "How did you determine when to begin grazing your wheat pasture," 51% checked visual assessment of top growth (Table 32

page 27). This ranged from 32% in the Panhandle to 68% in the South Central-East region. Statewide, 39% reported that they initiated grazing after the root system was anchored. The choice of root system was greatest (60%) in the Panhandle and least (23%) in the South Central-East. Other listed alternatives (calendar date, climate conditions, recommendation of others) were not frequently checked.

Timing of fall-winter grazing termination is critical to successful dual-purpose wheat production. Removing livestock from wheat prior to the first hollow stem growth stage is important to enable grain production (Croy, 1984; Redmon et al., 1996). Studies have shown that net return per acre to a dual-purpose enterprise declines significantly if grazing continues beyond the presence of first hollow stem (Krenzer, 2000c). The stem will not elongate in heavily grazed wheat, hence the first hollow stem stage of growth must be determined in ungrazed wheat of the same variety and planting date as the wheat being grazed (Krenzer, 1994).

Table 33 (page 27) includes a summary of the responses to the question about the most important factor producers used to determine when to terminate fall-winter grazing. Only 17% of the respondents indicated that they used the first hollow stem stage of ungrazed wheat to terminate grazing, while 14% identified using the first hollow stem stage of grazed wheat. Though calendar date of the first hollow stem stage can vary considerably from year to year (Christiansen et al., 1989), the majority (58%) of respondents checked that they used calendar date to determine when to terminate grazing. Very few respondents (2%) relied upon the recommendation of someone else. The responses across regions were similar to the state percentages.

Statewide, producers removed livestock from dual-purpose wheat on March 3 (Table 34 page 27). Krenzer (1994) found that stem elongation usually occurs in Central Oklahoma between March 1 and March 20. In the survey, the average date for removal of livestock from grazing in the Central and the North Central regions was February 29. The Panhandle region had the latest average date of March 9.

Supplements

Responses to a question about the types of supplement fed to cows and stocker cattle on wheat pasture are summarized in Tables 35 through 38 (page 28). Most producers indicated that they fed more than one supplement type. Among the cow producers who responded to this question, 78% used hay and 53% used a mineral supplement (Table 35). Other popular supplements were protein (25%) and wheat straw (22%). Hay (74%), mineral (57%), wheat straw (23%), and protein (17%) were also the most common stocker supplements (Table 36). They were the four most widely used supplements fed to both cows and stockers in each region. Only 2% of the cow producers and 4% of the stocker producers did not use any supplement. Few respondents indicated the use of other listed supplement choices (liquid, high-starch energy, high-fiber energy).

Mineral Supplements

Wheat pasture poisoning is a non-infectious metabolic disorder of cows grazed on wheat pasture. It occurs most frequently in mature cows that are in the latter stages of pregnancy or are nursing calves, and that have been grazing wheat pasture for 60 days or more. Cows with wheat pasture poisoning have low blood concentrations of both calcium and magnesium. While a similar, tetany-like condition may occur in stocker cattle, its incidence is extremely low. Considerable variation occurs in the mineral composition of wheat forage. Until more complete data are available, the data in Table 39 (page 29) have been selected to indicate the calcium, phosphorus, magnesium, and potassium content of wheat forage in relation to the requirements for the same minerals of a 400 lb steer calf gaining 2 lb per day (Horn, 2003).

The values in Table 39 indicate that wheat forage contains marginal to sufficient phosphorus and magnesium, excess potassium (which is characteristic of small grains forages in general) and inadequate amounts of calcium for growing cattle. Therefore, calcium is the macromineral of primary concern in many wheat grazing situations. In these situations, wheat pasture stockers should be supplemented with an additional 10 grams of calcium per day. While this may seem to be a very small amount of calcium (and therefore perhaps not of practical importance), for perspective the total calcium requirement of a 400 lb steer calf gaining 2 lb/day is 28 grams. The additional calcium could be included as calcium carbonate in other supplements or a mineral mixture. No mineral mixture will be efficacious if desired amounts are not consumed. Intake of mineral mixtures must be monitored.

The lower values for phosphorus content of wheat forage in Table 39 are from Bushland, Texas (Stewart et al., 1981). In this area, and perhaps the Panhandle of Oklahoma and Southwestern Kansas, wheat pasture stocker cattle should also receive supplemental phosphorus depending on soil type and actual mineral analysis of wheat forage. A case of

phosphorus deficiency in a group of growing steers grazing wheat pasture was detected near Loyal, Oklahoma (i.e., North-Central Oklahoma) (Horn, 2003). The field had been in alfalfa for about six years prior to wheat. The application of phosphorus fertilizer for the wheat crop was less than recommended from soil test results. Phosphorus, calcium, magnesium, and potassium contents of wheat forage samples collected on January 14 were, respectively, 0.16, 0.26, 0.16 and 1.72 % of DM. The Angus steers appeared healthy and were fairly fleshy, but seemed to crave bones, which were present in a native grass area adjacent to the wheat pasture, from carcasses of cows that had died in previous years. Depraved appetite or pica is a classical sign of phosphorus deficiency in beef cattle. The mineral mixture that was being fed was changed from a low-phosphorus mineral (4.0 %) to a mineral mixture that contained 12% calcium, 12% phosphorus, and 12% salt. According to the owner, this resolved the bone-chewing problem (Horn, 2003).

The question relative to the effect of feeding mineral mixtures (often high-magnesium mineral mixtures) to wheat pasture stockers on the incidence of bloat is commonly raised. There is no evidence to support the suggestion that supplemental magnesium will decrease the incidence and (or) severity of bloat of stocker cattle on wheat pasture (Horn, 2003). There may be a relationship between ruminal motility (and the ability of stocker cattle to eructate ruminal gases) and the calcium status of the cattle. Ruminal and gut motility is greatly compromised by subclinical deficiencies of calcium. Therefore, the concern of providing additional calcium to growing cattle on wheat pasture is two-fold: (1) to meet requirements for growth and (2) to perhaps decrease the bloat problem by an effect on ruminal motility (Horn, 2003). A potential research objective may be to determine if the so-called "dry bloat" problems that are sometimes observed in wheat pasture stocker cattle are related to a subclinical deficiency of calcium.

The survey found that more than half of the cow and stocker producers fed mineral supplements. Among those who grazed cows and who used mineral supplements, 79% checked magnesium as their primary mineral concern, 40% checked calcium, and 32% checked phosphorus (Table 37). The percentages for those grazing stockers were 74% for magnesium, 40% for calcium, and 42% for phosphorus (Table 38).

Table 40 (page 29) includes a summary of the primary reasons producers fed a supplement to stocker cattle. Statewide, 34% of the producers reported that providing supplemental nutrients such as minerals was the number one (most important) reason to feed a supplement; 27% reported providing additional roughage, 16% reported maintaining an ideal average daily gain, and 12% reported increasing stocking density during the fall-winter grazing season as the number one reason. Providing additional energy was not an important reason to most of the producers. The responses were similar across regions.

Stocker Health Problems and Additives Fed

Regarding the primary health problem of stockers after placement on wheat pasture, nearly all in the state reported either respiratory disease (53%) or bloat (41%) (Table 41 page 29). Bloat is a common problem associated with wheat pasture because of its high crude protein and low fiber contents (Horn et al., 1977). The Southwest region had the greatest percentages (57%) for bloat, while the North Central region had the greatest (60%) incidence of respiratory disease. Foot rot was not reported as a significant health problem except in the Central region (13%).

In the state, on average, the respondents reported 1.44% typical total death loss and 0.60% typical death loss from bloat for the wheat pasture stockers on their farms (Table 42 page 29). About half of the total death loss was from bloat, which underscores the significance of bloat as a herd health problem. The West Central region had the greatest averages for both average total death loss (1.72%) and death loss from bloat (0.71%), while the South Central-East region had the least averages (1.09% and 0.41%, respectively).

Bloat can be a big problem, especially during periods of rapid wheat growth in the fall and late winter. Shroyer et al. (1993) contend that feeding Bloat Guard (poloxalene) is one of the most effective practices for the prevention of bloat. Two ionophores, Rumensin (monensin) and Bovatec (lasalocid), are also available for wheat pasture stocker cattle. Both of them, if delivered in the proper dosage, increase weight gain of growing cattle on wheat pasture by 0.18 to 0.24 lb/day over that of the carrier supplement (Horn et al., 1981; Andersen and Horn, 1987). In addition, research by Branine and Galyean (1990) showed that Rumensin decreased the incidence and severity of bloat from wheat pasture. More recently, Paisley and Horn (1998) reported that Rumensin is more efficacious than Bovatec in decreasing both the incidence and severity of bloat of cattle grazing wheat pasture.

The survey found that 59% of the stocker cattle producers in the state fed at least one of the three additives to cattle on wheat pasture (Table 43 page 30). Ten percent used Rumensin only, 12% used Bovatec only, 20% used Bloat Guard only, and 17% used a combination of those three. Bloat Guard alone or in combination was used by 36% of the respondents. Bovatec alone or in combination was used by 24%. Rumensin alone or in combination was used by 18%. The Southwest region had the greatest percentage (72%) of stocker producers, who reported the use of at least one of the three additives. It was also the region where most producers (57%) identified bloat as the primary health problem.

The majority (61%) of the respondents, who fed Bloat Guard to stocker cattle, said that they had used it during the high bloat risk periods (Table 44 page 30). Statewide, 39% of the producers fed Bloat Guard during the entire wheat pasture season. Among those who used Rumensin, 26% indicated that they used it only to increase gain, 32% indicated that they used it only to decrease bloat, and 42% used it for both reasons. The percentages for Bovatec were 36%, 22%, and 42%, respectively. Most of the producers reported that Rumensin (81%) and Bovatec (78%) were self-fed.

Graze-out Management Practices

Averages for beginning weights, rates of gain, and stocking rates were considerably greater during the graze-out period (Table 45 page 30) compared with those of the fall-winter grazing period. The average beginning weights varied widely from region to region. The range of average weights was approximately three times greater than that for the fall-winter period. The state average beginning weights were 556 lb for steers and 526 lb for heifers. Consistent with the fall-winter grazing period, the greatest averages for beginning weights occurred in the North Central region. The South Central-East region had the least averages for both steers and heifers.

The average daily gains were 2.4 lb for steers and 2.2 lb for heifers. The reported rates of gain were greater for steers than heifers in most regions. The greatest average gains were reported in the Southwest region, 2.6 lb/day for steers and 2.5 lb/day for heifers. The least gains were in the South Central-East region, 2.1 lb/day for steers and 1.9 lb/day for heifers.

Stocking rates for the graze-out season are usually 1.5-2.0 times greater than the fall-winter rates. All reported average stocking rates were greater in the graze-out period compared with the fall-winter grazing period. The average stocking rates were 1.2 acres/head for steers and heifers, 2.3 acres/head for cows with fall calves, 2.2 acres/head for cows with spring calves, and 1.7 acres/head for cows only. The stocking rates for steers across regions were similar except in the South Central-East region, where the respondents reported a relatively low rate. All regions also had very similar stocking rates for heifers except the Panhandle and the South Central-East regions. As noted in Table 45, some of the reported regional stocking rates were calculated from very few available responses.

The decision of whether or not wheat will be grazed out can be delayed until shortly before or at the first hollow stem stage. This permits flexibility in response to changes in relative prices of wheat and cattle, weather, and federal farm programs. However, among those who responded to the question regarding timing of the decision to graze-out, 39% reported that the percentage of their total wheat acres that would be grazed out was determined prior to planting, while 35% reported that it was determined during the fall-winter grazing season (Table 46 page 30). Only 13% checked the choice, "when livestock were removed from fall-winter pasture," and 9% checked "at planting." The response summary across regions is included in Table 46.

In a related question, producers were asked to rank the top three factors that influence their decision on how many, if any, acres they would graze-out each year. Thirty-eight percent identified wheat prices and 29% identified cattle prices as the number one (most important) factor. Wheat and cattle prices were checked 33% and 30% of the time, respectively, as the number two factor (Table 47 page 31). They were the top two choices for the most important factor in all the regions. Cattle price, not wheat price, was the top choice for the number one factor only in the Central and the South Central-East regions. In the state as a whole, 9% said that cheat was the most important factor. Cheat refers to several of the annual winter grasses, also known as bromegrasses. Graze-out wheat provides a very effective way for controlling cool season weeds, such as cheat, which is expensive to control with herbicides (Krenzer, 1994). Cheat was particularly identified as a big problem in the North Central region. Among the other prominent factors statewide were lack of moisture and crop rotation. Lack of moisture was more important in the Panhandle, South Central-East, and Southwest regions.

Wheat Pasture Grazing Lease Arrangements

The USDA (1992) reported that 43% of the farmland in the U.S. was operated under lease agreements in 1992 compared with 35% in 1950. Analysis of agricultural land lease arrangements has been a strong focus of economists since the early writings of Adam Smith and John Stewart Mill (Dasgupta et al., 1999). An attempt was made to identify some of the common lease arrangements used for wheat pasture grazing in Oklahoma. Wheat pasture leases are somewhat unique in that three parties may be involved. One party may own the land (landlord), a second party may produce the wheat (wheat producer), and a third party may own and stock the livestock on the wheat (livestock producer). Wheat pasture contractual arrangements may involve all three parties or may involve only the wheat producer and the livestock producer.

Wheat pasture leasing may be a good option to many wheat producers, since they can reduce financial risk by not owning the livestock. The livestock producer's expected earnings, the wheat producer's costs, competition in the lease market, quality of pasture, amenities of the pasture land, relevant government programs, tax laws, and other related economic activities influence the structure of the lease agreements and rates (Doye et al., 2001).

The majority (58%) of the respondents, who indicated that they were involved in renting or leasing fall-winter wheat pasture, were wheat producers (Table 48 page 31). These individuals produced the wheat and leased the wheat pasture to someone else. However, 29% were livestock owners, who rented pasture from a wheat producer and stocked their cattle on wheat pasture. In addition, 13% of the respondents checked both livestock owner and wheat producer.

Legal experts recommend that producers have a written wheat pasture lease agreement, preferably drafted by an attorney (Tilley, 1988). However, the survey results showed that about 90% of the lease contracts statewide were oral and only 10% were written. This was consistent with the previous survey (True et al., 2001), when 82% of the leases were oral. In every region, more than 80% of the leases were oral.

On average, the size of the lease agreements was 303 acres. The range of the average size was from 212 acres in Central Oklahoma to 432 acres in the Panhandle region. The majority (63%) reported that the land had been leased for multiple years, while 38% reported a single year lease. Multiple year leases accounted for 79% of the agreements in the South Central-East region, and for 48% in the North Central region. On average, the multiple year leases extended for more than seven years; more than nine years in the Panhandle, and more than five years in the Central region.

Some respondents reported a combination of rental pricing methods. This suggests that some producers may have more than one lease arrangement. The methods of rate per hundredweight per month ($/cwt/month) and rate per pound of gain ($/lb of gain) were overwhelmingly popular for renting fall-winter grazing in all regions (Table 49 page 31). None of the respondents used rate per acre per month ($/acre/month). Very few respondents identified rate per acre per year ($/acre/year) and rate per head per month ($/head/month) as the methods used. The state average fall-winter grazing rental rates were $2.74 for the $/cwt/month method and $0.32 for the $/lb of gain method. The regional averages for $/cwt/month method ranged from $2.44 in the Southwest to $2.91 in the North Central region. The averages for $/lb of gain were similar across all regions.

The most widely used rental method for graze-out acreage was $/lb of gain, followed by $/acre/year and $/cwt/month (Table 50 page 32). Other methods were not common. The state averages were $74 for $/acre/year, $2.84 for $/cwt/month, and $0.32 for $/lb of gain. There were no noteworthy differences between the average rental prices of fall-winter grazing and graze-out for the $/cwt/month and $/lb of gain methods.

Lease agreements and negotiations involve assignments of responsibilities to supply relevant inputs and services to the contracting parties. One of the main goals of a fair and economically efficient contract is to recognize that the assignments should be done to curtail moral hazard by either of the parties. Moral hazard is a technical concept that refers to the risk that the presence of a contract will affect the behavior of one or more parties. The typical example is in the insurance industry, where insurance coverage might increase the risk-taking behavior of the insured. In the context of a wheat pasture lease, moral hazard refers to the potential (hazard) for either the wheat producer or the livestock owner to conduct an activity in a manner detrimental to the economic outcome of the other. For example, a livestock owner may benefit by keeping the cattle on the wheat after first hollow stem. However, this practice will reduce wheat grain yield and the wheat producer's income.

Some empirical studies have found that landlords expect tenant moral hazard in the use of

landlord-supplied inputs (Dasgupta et al., 1999). It is also possible for the tenant to under-invest in resources that have productive benefits beyond the lease term. Alternatively, landlords may under-invest when the benefits of the investment accrue solely during the lease term and mainly benefit the tenant. Hence, assignments of input responsibilities play an important role in determining the efficiency of resource use.

Respondents were asked to identify, under the fall-winter grazing rental price they gave, the responsible parties for a few selected services. Assuming that the livestock owners and wheat producers will be mostly tenants and landlords, respectively, lease agreements should have a tendency to assign the services that would primarily benefit cattle production to the livestock owners and the services that would enhance the land beyond the lease period to the wheat producers. This hypothesis was supported by the survey responses (Table 51 page 32). The majority of the respondents reported that livestock owners were responsible for checking livestock, salt and minerals, supplemental feeding, and supplemental pasture. The items for which the wheat producers were most frequently responsible for were fencing materials, fencing labor, fertilizer cost, and water. These findings were consistent with those of previous surveys (Doye et al., 2001; Doye et al., 1999; True et al., 2001).

Conclusions

The overall objective of this study was to provide information about production methods, management practices, and lease arrangements used by Oklahoma wheat, wheat pasture, and wheat pasture livestock producers. The specific objectives were to (1) determine the proportion of wheat grown for each of the three purposes (grain-only, forage-only, and dual-purpose) and determine if production practices differ across intended use; (2) determine production methods and management practices used by Oklahoma wheat, wheat pasture, and wheat pasture livestock producers; (3) determine characteristics of wheat pasture lease arrangements; and (4) to compare selected responses from the 2000 survey to those of the 1996 survey of Oklahoma wheat, wheat pasture, and wheat pasture livestock producers.

The information obtained from this research may be used to compare actual practices used by producers to recommended practices, to identify research and extension program needs, and to target extension programs to practices that deviate substantially from research-based recommendations.

Oklahoma farmers planted 6.1 million acres to wheat in the fall of 1999. Based upon the survey results, more than 3.7 million acres (61%) were grazed. Statewide, the respondents intended to use 20% of the wheat acreage for forage-only, 49% for dual-purpose, and 31% for grain-only, but due to weather constraints use was 22%, 39%, and 39%, respectively. Relative to 1995-96, the respondents intended and actually used more acreage for forage-only in 1999-2000. The difference may be related to changes in the relative prices of wheat and cattle and to changes resulting from the 1996 Federal Agricultural Improvement and Reform Act.

Oklahoma farmers use different wheat management practices depending upon intended use of the wheat. For example, average reported seeding rates were 94 lb/acre for forage-only, 84 lb/acre for dual-purpose, and 77 lb/acre for grain-only. Producers recognize the influence of planting date on wheat forage and grain yields. Respondents indicated average target planting dates of September 13 for forage-only, September 20 for dual-purpose, and October 2 for grain-only. Nitrogen use also differed depending upon intended use. Respondents, on average, used 69 lb/acre, 69 lb/acre, and 63 lb/acre for forage-only, dual-purpose, and grain-only, respectively.

Stocker cattle and cows and/or replacement heifers were by far the most common livestock species that grazed on 1999-2000 wheat pasture. The survey findings indicate that approximately 1,352,000 steers and heifers were stocked on Oklahoma wheat pasture during the 1999-2000 season (886,000 steers and 466,000 heifers). On average, the beginning weights for steers and heifers were 460 lb and 447 lb, respectively. Almost all regions reported daily gains in excess of 2 lb. The average stocking rates were 2.1 acres/steer and 2.0 acres/heifer.

Wheat pasture leases are somewhat unique in that three parties may be involved. One party may own the land (landlord), a second party may produce the wheat (wheat producer), and a third party may own and stock the livestock on the wheat (livestock producer). Wheat pasture contractual arrangements may involve all three parties or may involve only the wheat producer and the livestock producer. Some individuals may be involved in more than one type of contract. For example, 13% who indicated involvement in leases checked both livestock owner and wheat producer. And, some respondents used more than one method to establish rental charges. These results suggest that it is difficult to discern

detailed information regarding wheat pasture lease contracts from a mail questionnaire. An alternative method may be justified for a researcher interested in precise information regarding wheat pasture production contracts.

The survey identified several production practices that deviate substantially from current recommendations. For example, all reported forage-only and dual-purpose nitrogen uses were lower than recommendations. This suggests that farmers applied an insufficient quantity of nitrogen, or they expected the soil contained a substantial quantity of residual nitrogen, or the recommendation relative to nitrogen requirements for livestock production on grazing wheat is incorrect. Current nitrogen recommendations relative to forage production and livestock use were derived from wheat plots that were clipped rather than grazed. It could be that the quantity of nitrogen returned to the field in the form of urine and feces is substantial and that its value is underestimated. Additional research may be needed to more precisely determine forage and livestock response to nitrogen on plots that are actually grazed.

Wheat production specialists recommend that grazing should not be initiated until the coronal root system is developed. More than half of the respondents used visual assessment of top growth, rather than development of the coronal root system, to determine when to begin grazing.

Wheat production specialists also recommend that producers use the first hollow stem stage of ungrazed wheat of the same variety and planting date to determine when to terminate fall-winter grazing. Almost two thirds of the dual-purpose wheat producers did not reveal a correct understanding of the term "first hollow stem."

Livestock production specialists recommend the use of a receiving diet for stocker cattle. But, almost half of the respondents did not use a receiving diet.

Research has shown that in most situations wheat forage contains marginal to sufficient phosphorus and magnesium, excess potassium, and inadequate amounts of calcium for growing cattle. Therefore, calcium is the macromineral of primary concern. However, most producers (74%) indicated that magnesium rather than calcium (40%) was the macromineral of primary concern for cattle grazing wheat.

Legal experts recommend that producers have a written wheat pasture lease agreement. However, the survey results showed that about 90% of the lease contracts statewide were oral and only 10% were written.

The study findings enhance understanding of the actual practices of wheat and livestock producers in Oklahoma. This information will be useful in identifying the issues that need to be addressed in extension and research programs. It was determined in this and in the 1996 survey that producers do differentiate seeding rates, planting dates, and nitrogen uses according to the intended use of wheat. However, in most cases, the differences were not as much as recommended by research and extension specialists. The reported seeding and nitrogen rates were less than recommended for forage-only and dual-purpose production by a large margin.

Emphasis on wheat forage as a vital income source will warrant more studies on risk analysis, comparative economic returns, and efficient combinations of the potential three uses of wheat production. Wheat variety development research should continue the effort to select dual-purpose varieties for maximization of net income from the production of both forage and grain. As evident from the literature and discussions, successful dual-purpose wheat production requires unique management skills. Investment in research and extension programs is critical to improve the profitability and reduce financial risks associated with dual-purpose wheat production.

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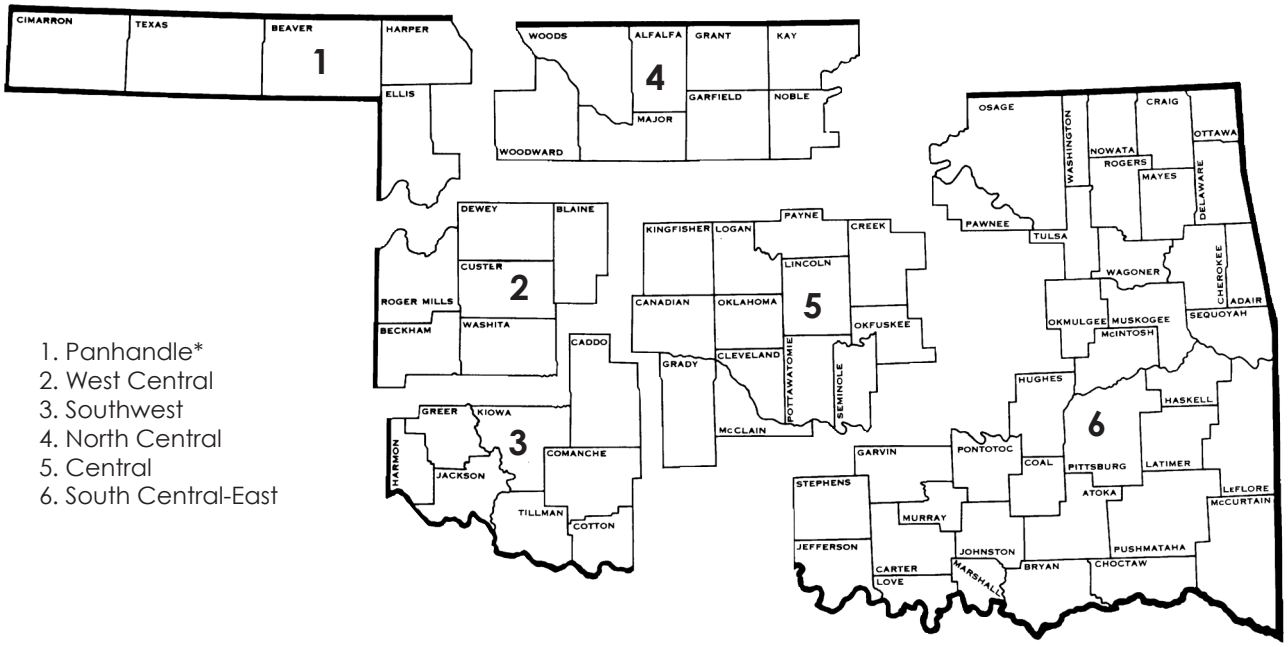

* Regions 1 through 5 correspond with agricultural staticstics districts as defined by the Oklahoma Agricultural Statistics Service. Region 6 includes four districts: South Central, Northeast, East Central, and Southeast.

Figure 1. Oklahoma wheat producing regions.

Table 1. Number of usable responses, number of wheat acres included in the survey, and size of survey relative to total planted Oklahoma wheat acreage in 1999-2000.

Region	Usable Responses	Total Wheat Acres of Respondents	Total Oklahoma Wheat Acres*	Percent of Total Acres Included in Survey
Panhandle	161	73,564	680,000	11%
West Central	192	86,349	900,000	10%
Southwest	193	100,504	1,350,000	7%
North Central	201	114,213	1,850,000	6%
Central	181	60,521	850,000	7%
South Central-East	162	25,846	470,000	5%
State	1090	460,997	6,100,000	8%

*Source: Oklahoma Agricultural Statistics Service, 2001c.

Table 2. Average July-December, 1999 precipitation (inches) in Oklahoma by region, with deviations of precipitation from historical (1971- 2000) averages shown in parentheses.

Region	July	August	September	October	November	December	Annual
Panhandle	1.47 (-1.08)	2.27 (-0.22)	1.95 (+0.06)	1.63 (+0.10)	0.00 (-1.01)	0.80 (+0.12)	24.04 (+3.00)
West Central	1.01 (-1.15)	1.98 (-0.74)	1.91 (-1.16)	1.42 (-1.17)	0.83 (-0.98)	2.65 (+1.48)	28.19 (-0.98)
Southwest	1.52 (-0.64)	0.31 (-2.36)	1.80 (-1.59)	2.36 (-0.66)	0.20 (-1.52)	3.02 (+1.60)	29.33 (-1.39)
North Central	2.61 (-0.39)	2.27 (-0.82)	4.62 (+1.50)	1.37 (-1.31)	0.46 (-1.65)	3.24 (+1.91)	42.46 (+10.54)
Central	1.44 (-1.15)	1.03 (-1.58)	4.49 (+0.46)	2.14 (-1.45)	0.58 (-2.13)	3.84 (+1.83)	39.29 (+1.98)
South Central	0.87 (-1.57)	1.68 (-0.84)	4.47 (+0.24)	2.68 (-1.45)	0.92 (-1.97)	2.33 (-0.11)	36.15 (-3.47)
Northeast	1.19 (-1.95)	1.48 (-1.65)	6.46 (+1.57)	1.62 (-2.11)	1.72 (-2.06)	4.19 (+1.71)	50.82 (+7.99)
East Central	1.39 (-1.56)	0.95 (-1.93)	5.28 (+0.34)	1.48 (-2.82)	1.87 (-2.49)	3.65 (+0.57)	45.57 (-0.59)
Southeast	0.97 (-2.63)	0.80 (-1.91)	3.17 (-1.33)	2.32 (-2.73)	1.76 (-3.17)	4.66 (+0.60)	42.08 (-8.75)
State	1.40 (-1.33)	1.43 (-1.33)	3.92 (+0.12)	1.90 (-1.49)	0.90 (-1.89)	3.15 (+1.10)	37.88 (+1.33)

Source: Oklahoma Agricultural Statistics Service, 2001a.

Table 3. Average January-June, 2000 precipitation (inches) in Oklahoma by region, with deviation of precipitation from historical (1971- 2000) averages shown in parentheses.

Region	January	February	March	April	May	June	Annual
Panhandle	0.63 (+0.11)	0.38 (-0.15)	5.13 (+3.53)	1.37 (-0.48)	1.87 (-1.49)	3.78 (+0.85)	22.64 (+1.60)
West Central	0.42 (-0.46)	1.64 (+0.49)	6.11 (+3.74)	2.93 (+0.36)	1.97 (-2.84)	7.02 (+3.15)	31.46 (+2.29)
Southwest	0.45 (-0.65)	1.29 (-0.10)	4.36 (+2.11)	2.98 (+0.34)	2.33 (-2.52)	7.17 (+3.06)	33.79 (+3.07)
North Central	0.72 (-0.23)	1.64 (+0.39)	6.33 (+3.61)	1.68 (-1.27)	4.88 (+0.15)	6.08 (+2.09)	33.71 (+1.79)
Central	1.16 (-0.23)	1.55 (-0.28)	3.63 (+0.51)	2.61 (-0.84)	4.78 (-0.71)	7.34 (+2.85)	39.77 (+2.46)
South Central	2.06 (+0.22)	1.41 (-0.78)	3.22 (-0.19)	3.15 (-0.45)	2.02 (-3.44)	6.49 (+2.02)	39.62 (0.00)
Northeast	1.25 (-0.47)	2.02 (-0.05)	4.31 (+0.56)	1.99 (-2.05)	8.97 (+3.57)	8.36 (+3.66)	41.95 (-0.88)
East Central	2.69 (+0.47)	1.85 (-0.64)	2.73 (-1.32)	3.10 (-1.18)	6.45 (+0.66)	11.64 (+6.82)	47.10 (+0.94)
Southeast	1.49 (-1.32)	1.98 (-1.16)	3.33 (-1.12)	3.71 (-0.77)	5.40 (-0.98)	8.62 (+3.90)	48.14 (-2.69)
State	1.22 (-0.26)	1.52 (-0.26)	4.32 (+1.24)	2.56 (-0.76)	4.38 (-0.75)	7.32 (+3.08)	37.58 (+1.03)

Source: Oklahoma Agricultural Statistics Service, 2001b.

Table 4. Average annual temperatures in 1999 and 2000, and historical (1971-2000) averages in Oklahoma by region (Degrees Fahrenheit).

Region	1999	2000	1971-2000
Panhandle	58.0	58.2	56.6
West Central	60.5	59.4	59.5
Southwest	62.6	61.6	61.5
North Central	59.7	58.8	58.9
Central	61.9	60.6	60.6
South Central	63.6	62.4	62.3
Northeast	61.3	59.9	59.4
East Central	62.6	61.1	60.8
Southeast	63.0	61.9	61.6
State	61.4	60.4	60.1

Source: Oklahoma Agricultural Statistics Service, 2001a.

Table 5. Total acres in farming operation.

Region	Total acres	Percent of total owned	Average size owned*	Percent of total leased	Average size leased*
Panhandle	321,972	47%	1,017	53%	1,342
West Central	229,051	53%	681	47%	731
Southwest	220,171	49%	600	51%	816
North Central	231,174	50%	632	50%	826
Central	173,567	51%	528	49%	724
South Central-East	126,503	59%	487	41%	526
State	1,302,438	50%	651	50%	835

* Total number of acres were divided equally into owned and leased, but there were fewer numbers of respondents who had leased compared with those who had owned acres. Therefore, the average size leased was greater than the average size owned.

Table 6. Survey respondents who indicated membership in OWGA*, OGSP, and/or OCA (%).

Region	OWGA only	OGSP only	OCA only	Both OWGA & OGSP	Both OWGA & OCA	Both OGSP & OCA	All three	None of the three
Panhandle	9	1	15	1	5	1	0	68
Wheat Acres Planted**	7	1	17	0	6	3	0	66
West Central	10	0	13	1	8	1	0	68
Wheat Acres Planted	9	0	15	2	11	2	0	62
Southwest	18	0	14	1	5	0	1	62
Wheat Acres Planted	18	0	16	0	7	0	0	58
North Central	14	1	12	0	9	0	2	61
Wheat Acres Planted	13	1	12	0	11	0	4	58
Central	8	0	17	0	11	0	1	62
Wheat Acres Planted	6	0	25	0	21	0	1	46
South Central-East	5	0	14	0	2	1	1	77
Wheat Acres Planted	8	0	21	0	4	1	0	65
State	11	0	14	0	7	0	1	66
Wheat Acres Planted	11	0	17	0	10	1	1	59

* OWGA = Oklahoma Wheat Growers Association ; OGSP = Oklahoma Grain and Stocker Producers; OCA = Oklahoma Cattlemen's Association.
** Proportion of the members' reported wheat acreage with respect to the reported total planted wheat acres in the survey.

Table 7. Survey respondents, classified by intended use of wheat, who indicated membership in OWGA*, OGSP, and/or OCA (%).

Region	OWGA only	OGSP only	OCA only	Both OWGA & OGSP	Both OWGA & OCA	Both OGSP & OCA	All three	None of the three
Grain-only								
Panhandle	18	4	4	0	5	0	0	69
West Central	19	0	6	0	0	0	0	75
Southwest	38	0	4	0	0	0	0	58
North Central	20	0	7	0	7	0	2	64
Central	6	0	11	0	6	0	0	78
South Central-East	6	0	6	0	0	0	0	87
State	18	1	6	0	4	0	1	71
Forage-only								
Panhandle	13	0	25	0	0	0	0	63
West Central	0	0	7	4	7	0	0	82
Southwest	0	0	23	0	0	0	0	77
North Central	0	0	17	0	0	0	0	83
Central	4	0	21	0	4	0	2	69
South Central-East	2	0	14	0	2	1	1	80
State	3	0	17	0	3	0	1	76
Forage and Grain								
Panhandle	5	0	21	1	5	1	0	68
West Central	11	0	14	1	9	1	0	64
Southwest	18	0	15	0	7	0	1	58
North Central	13	1	14	1	9	0	2	60
Central	11	0	17	0	15	0	1	56
South Central-East	10	0	20	0	5	0	0	66
State	12	0	16	0	9	0	1	61

* OWGA = Oklahoma Wheat Growers Association ; OGSP = Oklahoma Grain and Stocker Producers; OCA = Oklahoma Cattlemen's Association. Grain-only - Producers who planted wheat intended only for grain; Forage-only - Producers who planted wheat intended only for grazing; Forage and Grain - Producers who intended to use their wheat to produce both fall-winter forage and grain.

Table 8, Percentage of respondents who indicated that a crop such as rye or ryegrass was planted with the wheat and the percentage of total wheat acres that included a combination.

Region	Respondents who planted a crop with wheat, such as rye or ryegrass	Wheat acreage that included a combination
Panhandle	3.1	1.6
West Central	9.4	2.9
Southwest	11.4	3.8
North Central	6.0	0.7
Central	19.3	9.8
South Central-East	30.9	16.2
State	13.0	4.0

Table 9. Frequency of soil test as reported by the respondents (%).

Region	Every Year	Every 2 Years	Every 3 Years	Seldom or Never	Other
Panhandle	15	15	21	48	1
West Central	10	25	30	30	4
Southwest	11	15	37	37	1
North Central	16	15	31	36	2
Central	9	13	35	39	4
South Central-East	5	19	36	35	5
State	11	17	32	37	2

Table 10. Percentage of each definition of "first hollow stem" responses across intended use by region.

Region	Joint or node above soil	Developing head is above soil	Hollow stem above roots	Not familiar
*Grain-only**				
Panhandle	18	8	21	53
West Central	7	27	20	46
Southwest	26	13	17	43
North Central	28	13	29	30
Central	25	6	31	38
South Central-East	10	3	23	64
State	20	11	24	45
*Forage-only***				
Panhandle	12	6	38	44
West Central	16	4	32	48
Southwest	9	8	22	61
North Central	33	0	0	67
Central	9	4	22	65
South Central-East	13	10	15	62
State	13	7	21	59
*Dual-purpose****				
Panhandle	26	15	27	32
West Central	20	12	35	33
Southwest	23	13	30	34
North Central	11	20	44	25
Central	20	10	39	31
South Central-East	6	9	41	44
State	19	14	36	31

* Grain-only - Producers who intended to use all of their acreage for the purpose of grain-only.
** Forage-only - Producers who intended to use all of their acreage for the purpose of forage-only.
*** Dual-purpose - Producers who had at least some proportion of their acreage for dual-purpose.

Table 11. Characteristics of wheat used to determine which variety to plant (%).

	ForageYield			GrainYield			Aluminum or pH tolerance			Test Weight			Coleoptile Length			Winter Hardiness			Drought Tolerance			Late Frost Tolerance			Insect Resistance		
Region	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3
Panhandle	20*	14*	11*	48	22	6	0	0	0	3	15	10	1	1	6	6	7	7	6	14	14	0	2	5	0	2	5
West Central	44	25	7	43	30	8	2	3	9	2	12	19	1	2	4	2	4	7	2	7	11	0	2	4	1	0	2
Southwest	37	21	9	46	22	10	0	2	4	2	12	16	1	2	1	0	4	6	3	10	11	0	2	1	0	2	5
North Central	23	19	9	59	21	7	3	5	9	6	19	16	1	3	5	1	4	3	1	3	5	0	1	3	0	2	3
Central	49	18	7	38	18	7	1	2	7	3	13	13	0	3	3	1	9	10	3	9	8	0	2	2	1	5	4
South Central-East	53	18	5	27	15	8	1	2	0	1	11	8	0	0	1	6	12	8	4	13	10	1	3	3	1	5	7
State	38	19	8	44	22	8	1	3	5	3	14	14	1	2	3	2	7	7	3	9	9	0	2	3	0	3	4

* Example: Forage yield received 20% of all number one counts (most important), 14% of all number two counts, and 11% of all number three counts in the Panhandle region.

Table 11 (Continued). Characteristics of wheat used to determine which variety to plant (%).

	Height of Plant			Past Success			Disease Resistance			Maturity			Pedigree			Shattering Reputation			Lodging			Milling &Baking Quality			Other		
Region	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3
Panhandle	0	3	3	12	8	8	1	2	8	0	1	2	0	1	0	1	3	6	1	1	1	0	2	5	1	0	1
West Central	1	3	2	1	5	11	0	2	9	0	2	3	1	0	1	0	0	2	0	0	1	0	1	1	1	0	0
Southwest	0	3	5	6	9	13	2	2	7	1	4	5	0	1	1	1	2	4	0	1	2	0	1	1	1	0	0
North Central	1	3	4	3	7	12	1	6	12	0	3	3	0	0	2	1	1	2	0	2	2	0	1	2	1	0	1
Central	1	6	4	4	6	18	0	2	10	1	4	2	0	0	0	0	0	1	0	0	3	0	1	1	0	0	0
South Central-East	1	4	6	3	4	21	1	8	14	0	3	4	0	0	1	0	1	1	0	1	3	0	0	0	1	0	1
State	1	4	4	5	7	13	1	4	10	0	3	3	0	0	1	0	1	3	0	1	2	0	1	2	1	0	0

Table 12. Sources of information used to select which variety of wheat to plant (%).

	Test Plot			Neighboring Fields			Seed Availability			Past Performance			Research Publications			Extension Service			Seed Company Info.			Other		
Region	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3
Panhandle	15*	16*	12*	8	34	19	5	13	28	59	22	9	7	9	16	2	4	7	3	2	7	1	0	1
West Central	18	18	18	12	32	20	4	13	24	54	19	13	8	12	14	2	3	5	2	2	5	0	0	1
Southwest	18	19	20	16	31	18	6	11	22	54	22	11	3	11	17	1	3	7	3	3	5	0	0	0
North Central	24	22	12	12	25	18	6	11	18	44	26	14	7	8	23	4	3	7	2	5	5	1	0	2
Central	19	11	13	9	29	21	11	15	28	51	22	10	6	13	15	0	4	6	4	4	8	1	1	0
South Central-East	16	9	6	8	25	23	20	24	25	43	23	15	3	8	12	6	1	10	4	10	6	0	1	2
State	18	16	14	11	30	20	8	14	24	51	22	12	6	10	16	2	3	7	3	4	6	1	0	1

* Example: Test plot received 15% of all number one counts (most important), 16% of all number two counts, and 12% of all number three counts in the Panhandle region.

Table 13. Percent of wheat acres planted for intended use of grain-only, forage-only, and dual-purpose by region in Oklahoma, 1999-2000.

Region	Grain-only	Forage-only	Dual-Purpose
Panhandle	45	10	45
West Central	16	23	61
Southwest	27	25	48
North Central	46	9	45
Central	16	30	54
South Central-East	30	49	21
State	31	20	49

Table 14. Percent of wheat acres actually used for grain-only, forage-only, and dual-purpose by region in Oklahoma, 1999-2000.

Region	Grain-only	Forage-only	Dual-Purpose
Panhandle	53	15	32
West Central	29	25	46
Southwest	36	25	39
North Central	51	11	38
Central	22	30	48
South Central-East	30	49	21
State	39	22	39

Table 15. Statewide percent of wheat acres for grain-only, forage-only, and dual-purpose in Oklahoma, 1995-96 and 1999-2000.

	1995-96	1999-2000
Intended use		
Grain-Only	25	31
Forage-Only	9	20
Dual-Purpose	66	49
Actual use		
Grain-Only	50	39
Forage-Only	9	22
Dual-Purpose	41	39

Table 16. Wheat producers who indicated their intention to grow wheat for one or for more than one purpose (%).

Region	Grain-only	Forage-only	Dual-Purpose Only	Grain-only & Forage-only	Grain-only & Dual-Purpose	Forage-only & Dual-Purpose	Grain-only Forage-only & Dual-Purpose
Panhandle	35	10	30	6	9	7	3
West Central	9	15	41	8	5	19	3
Southwest	13	14	28	5	9	18	12
North Central	28	3	28	6	12	11	12
Central	10	29	25	7	7	12	9
South Central-East	19	55	10	6	3	4	3
State	19	20	27	6	8	12	7

Table 17. Average seeding rate across intended use by region (lb/acre).

Region	Grain-only	Forage-only	Dual-Purpose
Panhandle	52[a] (81, 16)*	73[b] (33, 21)	61[c] (69, 19)
West Central	80[a] (71, 16)	89[b] (78, 18)	86[b] (123, 16)
Southwest	81[a] (93, 17)	90[b] (88, 21)	89[b] (114, 19)
North Central	77[a] (118, 14)	85[b] (59, 16)	81[b] (108, 14)
Central	87[a] (66, 16)	99[b] (94, 22)	90[a] (89, 17)
South Central-East	96[a] (52, 18)	109[b] (90, 22)	108[b] (35, 25)
State	77[a] (481, 20)	94[b] (442, 23)	84[c] (538, 21)

* Means with common lettered superscript within each row (region) are not statistically different from each other at $\alpha = 0.05$. Numbers in parentheses are sample size and standard deviation, respectively.

Table 18. Comparison of the state averages of seeding rate (lb/acre), planting date, and nitrogen rate (lb/acre) across intended use, 1995-96 and 1999-2000.

	1995-96	1999-2000
Seeding rate		
Grain-Only	72[a] (404, 21)*	77[b] (481, 20)
Forage-Only	90[a] (226, 24)	94[b] (442, 23)
Dual-Purpose	79[a] (535, 20)	84[b] (538, 21)
Target planting date		
Grain-Only	9/27[a] (397, 14)	10/2[b] (449, 16)
Forage-Only	9/10[a] (214, 14)	9/13[b] (423, 14)
Dual-Purpose	9/17[a] (513, 11)	9/20[b] (498, 13)
Actual planting date		
Grain-Only	10/7[a] (322, 15)	10/10[b] (317, 17)
Forage-Only	9/23[a] (178, 18)	9/24[a] (294, 18)
Dual-Purpose	10/1[a] (431, 15)	9/30[a] (368, 17)
Nitrogen rate		
Grain-Only	66[a] (275, 37)	63[a] (398, 32)
Forage-Only	78[a] (145, 41)	69[b] (358, 35)
Dual-Purpose	70[a] (364, 32)	69[a] (424, 34)

* Means with common lettered superscript within each row (intended use) are not statistically different from each other at $\alpha = 0.05$. Numbers in parentheses are sample size and standard deviation, respectively.

Table 19. Target planting date across intended use by region.

Region	Grain-only	Forage-only	Dual-Purpose
Panhandle	9/23[a] (83, 12)*	9/9[b] (38, 17)	9/16[b] (66, 16)
West Central	9/30[a] (70, 16)	9/12[b] (74, 11)	9/20[c] (110, 13)
Southwest	10/5[a] (81, 17)	9/16[b] (81, 16)	9/22[b] (104, 14)
North Central	10/4[a] (108, 13)	9/15[b] (59, 13)	9/22[c] (99, 10)
Central	10/4[a] (60, 15)	9/12[b] (93, 14)	9/20[c] (88, 12)
South Central-East	10/5[a] (47, 21)	9/13[b] (84, 13)	9/15[b] (31, 13)
State	10/2[a] (449, 16)	9/13[b] (423, 14)	9/20[c] (498, 13)

* Means with common lettered superscript within each row (region) are not statistically different from each other at $\alpha = 0.05$. Numbers in parentheses are sample size and standard deviation, respectively.

Table 20. Actual 1999 planting date across intended use by region.

Region	Grain-only	Forage-only	Dual-Purpose
Panhandle	10/6 [a] (59, 19)*	9/27 [a] (23, 29)	9/28 [a] (49, 21)
West Central	10/11 [a] (38, 20)	9/25 [b] (55, 16)	10/3 [a] (81, 20)
Southwest	10/16 [a] (61, 18)	9/28 [b] (51, 20)	10/2 [b] (73, 18)
North Central	10/9 [a] (74, 11)	9/24 [b] (39, 13)	9/29 [c] (73, 9)
Central	10/12 [a] (48, 16)	9/22 [b] (69, 18)	9/26 [b] (67, 13)
South Central-East	10/8 [a] (37, 20)	9/21 [b] (57, 17)	9/24 [b] (25, 18)
State	10/10 [a] (317, 17)	9/24 [b] (294, 18)	9/30 [c] (368, 17)

* Means with common lettered superscript within each row (region) are not statistically different from each other at $\alpha = 0.05$. Numbers in parentheses are sample size and standard deviation, respectively.

Table 21. Actual average nitrogen applied across intended use by region (lb/acre).

Region	Grain-only	Forage-only	Dual-Purpose
Panhandle	42 [a] (61, 28)*	50 [a b] (30, 24)	56 [b] (47, 30)
West Central	66 [a] (58, 38)	63 [a] (62, 31)	64 [a] (94, 33)
Southwest	67 [a] (76, 30)	72 [a] (72, 33)	74 [a] (93, 34)
North Central	63 [a] (98, 27)	66 [a] (51, 30)	69 [a] (93, 33)
Central	67 [a] (59, 34)	74 [a] (80, 37)	74 [a] (71, 31)
South Central-East	75 [a] (46, 33)	78 [a] (63, 41)	88 [a] (24, 45)
State	63 [a] (398, 32)	69 [b] (358, 35)	69 [b] (434, 34)

* Means with common lettered superscript within each row (region) are not statistically different from each other at $\alpha = 0.05$. Numbers in parentheses are sample size and standard deviation, respectively.

Table 22. Fall-winter wheat pasture use by livestock type, 1999-2000 (%).

Region	Stocker Cattle	Cows and/or Replacement Heifers	Both Stocker Cattle and Cows and/or Replacement Heifers	Sheep	Dairy Cattle	Horses	Other
Panhandle	56	24	18	0	1	0	1
West Central	35	19	38	2	1	5	0
Southwest	37	24	34	1	1	2	1
North Central	52	18	24	1	0	2	3
Central	40	21	28	2	4	4	1
South Central-East	41	28	21	1	4	4	1
State	42	22	28	1	2	3	1

Table 23. Estimated number of wheat acres used for forage in Oklahoma and estimated number of stocker steers on 1999-2000 Oklahoma wheat pasture.

Region	Total Oklahoma Wheat Acres* (A)	Percent used for Forage** (B)	Total Wheat Acres used for Forage (C=A x B)	Percent used by Stocker Steers† (D)	Total Wheat Acres Stocked with Stocker Steers (E=C x D)	Stocking Rate Acres/Steer†† (F)	Estimated Number of Steers (G=E ÷ F)
Panhandle	680,000	47	316,954	45	142,629	2.4	60,134
West Central	900,000	71	640,713	45	288,321	2.0	144,922
Southwest	1,350,000	64	868,378	49	425,505	2.3	185,592
North Central	1,850,000	49	897,483	56	502,591	2.4	212,051
Central	850,000	78	663,146	55	364,730	1.8	202,939
South Central-East	470,000	70	327,698	39	127,802	1.5	82,668
State	6,100,000	61	3,729,091	49	1,827,254	2.1	886,351

* Oklahoma Agricultural Statistics Service, 2001c.
** Table 14.
† Derived from survey results.
†† Table 25.

Table 24. Estimated number of wheat acres used for forage in Oklahoma and estimated number of stocker heifers on 1999-2000 Oklahoma wheat pasture.

Region	Total Oklahoma Wheat Acres* (A)	Percent used for Forage** (B)	Total Wheat Acres used for Forage (C=A x B)	Percent used by Stocker Heifers† (D)	Total Wheat Acres Stocked with Stocker Heifers (E=C x D)	Stocking Rate Acres/Heifer†† (F)	Estimated Number of Heifers (G=E ÷ F)
Panhandle	680,000	47	316,954	29	91,917	2.5	36,814
West Central	900,000	71	640,713	26	166,585	2.1	80,908
Southwest	1,350,000	64	868,378	20	173,676	2.0	87,505
North Central	1,850,000	49	897,483	28	251,295	2.3	111,390
Central	850,000	78	663,146	27	179,049	1.7	107,740
South Central-East	470,000	70	327,698	19	62,263	1.6	39,793
State	6,100,000	61	3,729,091	25	932,273	2.0	466,136

* Oklahoma Agricultural Statistics Service, 2001c.
** Table 14.
† Derived from survey results.
†† Table 25.

Table 25. Average fall-winter grazing cattle beginning weights, rates of gain, and stocking rates.

Region	Beginning Weight Steers (lb)	Beginning Weight Heifers (lb)	Rate of Gain Steers (lb/day)	Rate of Gain Heifers (lb/day)	Stocking Rate Steers (acres/hd)	Stocking Rate Heifers (acres/hd)	Stocking Rate Cows with Fall Calves (acres/hd)	Stocking Rate Cows with Spring Calves (acres/hd)	Stocking Rate Cows (acres/hd)
Panhandle	464	449	2.3	2.1	2.4	2.5	6.9**	6.1*	3.0**
West Central	449	430	2.2	2.1	2.0	2.1	3.7	2.6	3.2**
Southwest	454	446	2.3	2.2	2.3	2.0	3.8	3.5	3.0*
North Central	479	466	2.4	2.1	2.4	2.3	4.3	3.8	3.3**
Central	476	449	2.4	2.3	1.8	1.7	2.6	2.6	2.7*
South Central-East	436	440	2.1	2.0	1.5	1.6	2.9	2.4	1.6**
State	460	447	2.3	2.1	2.1	2.0	3.5	3.3	2.9

* Less than 25 observations used to calculate.
** Less than 15 observations used to calculate.

Table 26. The months when stocker cattle for fall-winter grazing were purchased by the respondents (%).

REGION	July Only	Aug Only	Sept Only	Oct Only	Nov Only	Dec Only	Other single Months	Oct Nov	Nov Dec	Oct Nov Dec	Other Combination of months
Panhandle	6*	13	13	13	6	3	10	3	3	6	23
West Central	8	8	11	17	17	2	5	2	3	8	23
Southwest	2	13	3	13	17	7	7	2	0	2	35
North Central	0	2	5	24	16	5	8	8	5	8	19
Central	6	8	6	9	8	8	5	5	5	8	34
South Central-East	0	4	11	15	22	7	11	0	7	4	19
State	4	8	7	15	14	5	7	4	4	6	27

* Example: 6% of the respondents purchased stocker cattle only in July.

Table 27. Percentage of stocker producers who mass medicated stockers with an antibiotic after purchase and before placement on wheat.

Region	Mass Medicated
Panhandle	41
West Central	40
Southwest	49
North Central	40
Central	41
South Central-East	38
State	42

Table 28. Average number of days producers typically had purchased stockers on the farm before placing them on wheat.

Region	Purchase Days
Panhandle	31
West Central	28
Southwest	27
North Central	26
Central	23
South Central-East	24
State	26

Table 29. Reported receiving diets for purchased stocker cattle (%).

Region	Own Diet	Commercial Diet	Pre-Conditioned	No Diet
Panhandle	23	26	11	40
West Central	26	16	8	50
Southwest	18	24	16	42
North Central	28	27	4	41
Central	16	24	4	56
South Central-East	17	20	6	57
State	21	23	8	48

Table 30. Average days and cost of stocker receiving diets.

	Producer's Own Diet		Commercial Diet	
Region	Days	Cost ($/Head*)	Days	Cost ($/Head*)
Panhandle	25.73**	9.15**	22.50**	18.20**
West Central	22.79	11.87	16.88**	17.36**
Southwest	22.55**	10.26**	19.57	15.07
North Central	20.55	9.71**	22.53	12.75**
Central	22.20**	19.19**	20.57	12.87
South Central-East	27.88**	11.20**	19.64**	17.19**
State	23.04	11.52	20.33	15.06

* Dollars per head for the entire receiving period.
** Less than 15 observations used to calculate.

Table 31. Stocker cattle feeding program during receiving (%).

Region	Grass hay alone	Silage	Alfalfa hay alone	Silage plus supplement	Grass hay plus high-protein supplement	Self-fed mixed ration	Grass hay plus high-energy supplement	Daily hand-fed mixed ration	Alfalfa hay plus high-energy supplement	Other
Panhandle	7	0	7	2	21	5	21	19	0	17
West Central	18	1	4	1	24	7	21	5	11	8
Southwest	16	0	6	1	24	8	18	8	10	10
North Central	10	0	4	0	31	1	33	4	7	7
Central	19	0	5	1	32	3	13	8	8	11
South Central-East	23	0	4	2	30	2	26	5	5	4
State	16	0	5	1	27	4	22	8	8	9

Table 32. Factors that producers used to determine when to begin grazing wheat (%).

Region	Calendar Date	Assessment of Top Growth	Climate Conditions	Anchored Root System	Recommendation of others	Other
Panhandle	0	32	8	60	0	0
West central	3	41	6	48	0	2
Southwest	2	59	4	34	0	1
North Central	5	41	6	45	1	2
Central	3	58	6	31	0	2
South Central-East	1	68	5	23	1	2
State	2	51	6	39	0	2

Table 33. Factors that producers used to determine when to terminate fall-winter grazing (%).

Region	Calendar Date	First hollow stem stage of ungrazed wheat	First hollow stem stage of grazed wheat	Recommendation of others	Other
Panhandle	47	25	13	0	14
West central	60	18	14	1	7
Southwest	68	11	13	3	5
North Central	57	22	12	2	7
Central	57	14	15	3	11
South Central-East	50	13	13	2	22
State	58	17	14	2	10

Table 34. Average grazing termination date used by producers who planned to harvest wheat for grain.

Region	Date
Panhandle	March 9
West central	March 6
Southwest	March 1
North Central	February 29
Central	February 29
South Central-East	March 1
State	March 3

Table 35. Types of supplement fed to cows on wheat pasture (%).

Region	None	Hay	Protein	Liquid	High Starch Energy	Wheat Straw	High Fiber Energy	Mineral	Other
Panhandle*	11	59	26	0	11	15	7	59	4
West Central	1	85	30	4	4	30	4	52	0
Southwest	1	73	21	9	3	31	3	50	6
North Central	4	71	27	4	2	20	0	57	2
Central	0	80	26	2	4	16	1	54	1
South Central-East	4	86	25	2	2	16	7	54	0
State	2	78	25	4	3	22	3	53	2

* Row totals are greater than 100% as most producers used more than one type.

Table 36. Types of supplement fed to stocker cattle on wheat pasture (%).

Region	None	Hay	Protein	Liquid	High Starch Energy	Wheat Straw	High Fiber Energy	Mineral	Other
Panhandle*	10	60	19	2	10	21	8	52	10
West Central	2	76	14	7	9	29	4	46	2
Southwest	3	68	13	6	4	36	7	60	1
North Central	5	78	17	3	7	20	2	60	3
Central	5	81	16	3	7	12	3	61	2
South Central-East	3	76	24	1	10	16	4	63	0
State	4	74	17	4	7	23	4	57	3

* Row totals are greater than 100% as most producers used more than one type.

Table 37. Mineral supplement of primary concern to the cow producers (% of respondents who checked at least one of the four mineral types).

Region	Calcium	Phosphorus	Magnesium	Other
Panhandle*	53	20	73	7
West Central	36	28	89	8
Southwest	35	50	79	9
North Central	50	13	75	0
Central	44	33	67	11
South Central-East	29	36	89	7
State	40	32	79	8

* Row totals are greater than 100% as most producers checked more than one type.

Table 38. Mineral supplement of primary concern to the stocker cattle producers (% of respondents who checked at least one of the four mineral types).

Region	Calcium	Phosphorus	Magnesium	Other
Panhandle*	29	52	71	10
West Central	41	30	78	5
Southwest	43	41	65	4
North Central	28	42	84	2
Central	55	47	66	9
South Central-East	37	45	84	8
State	40	42	74	6

* Row totals are greater than 100% as most producers checked more than one type.

Table 39. Mineral composition of wheat forage and mineral requirements of steers.

Item	Calcium	Phosphorus	Magnesium	Potassium
Composition, % of DM	.35	.25 - .40	.15	3-5
Requirement[a]	.56	.26	.10	0.7

[a]400 lb growing steer gaining 2 lb/day and consuming 11 pounds DM/day.
Source: Horn, 2003.

Table 40. Primary reasons producers gave for feeding a supplement to stocker cattle on wheat pasture (%).

	Nutrients			Energy			Roughage			Gain			Stocking Density			Other		
Region	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3
Panhandle[†]	30*	17*	6*	13	15	21	26	24	18	15	22	24	15	20	27	2	2	3
West Central	31	21	13	3	19	33	26	27	10	17	20	27	17	11	16	7	1	2
Southwest	38	22	12	3	10	21	25	27	16	17	24	26	12	16	12	6	1	12
North Central	33	30	6	6	22	19	26	25	8	17	8	31	8	11	31	11	3	4
Central	38	21	12	2	10	25	31	30	12	15	26	22	10	12	23	5	1	7
South Central-East	33	17	8	3	9	25	29	26	11	17	17	31	10	28	19	8	4	6
State	34	22	10	4	14	24	27	27	12	16	20	27	12	15	21	6	2	6

[†] Row totals may not add up to 100% due to rounding errors.
* Example: Nutrients received 30% of all number one counts (most important), 17% of all number two counts and 6% of all number three counts in the Panhandle region.

Table 41. Reported primary health problem of stockers after placement on wheat pasture (%).

Region	Bloat	Respiratory Disease	Foot Rot	Polioencephalomalacia	Other
Panhandle	41	57	2	0	0
West Central	39	55	3	0	3
Southwest	57	42	1	0	0
North Central	37	60	2	0	0
Central	33	53	13	1	0
South Central-East	38	54	5	0	3
Sate	41	53	4	0	1

Table 42. Total death loss and death loss from bloat on the farm's of the respondents (%).

Region	Total Death Loss	Death Loss From Bloat
Panhandle	1.21	0.58
West Central	1.72	0.71
Southwest	1.55	0.68
North Central	1.54	0.56
Central	1.34	0.57
South Central-East	1.09	0.41
State	1.44	0.60

Table 43. Producers who reported the feeding of Rumensin, Bovatec, and Bloat Guard as additives (% of respondents who reported grazing stocker cattle on wheat pasture).

Region	Rumensin Only	Bovatec Only	Bloat Guard Only	Rumensin & Bovatec	Rumensin & Bloat Guard	Bovatec & Bloat Guard	All Three
Panhandle*	10	14	19	0	8	8	0
West Central	9	11	19	2	8	8	2
Southwest	12	14	23	1	4	15	3
North Central	11	11	22	0	5	11	0
Central	9	15	16	3	4	8	3
South Central-East	8	7	24	2	2	1	4
State	10	12	20	1	5	9	2

* Since many respondents did not check any of the additives, row totals do not add up to 100%.

Table 44. Reasons and type of feeding for additives reported by stocker cattle producers (%).

	Rumensin					Bovatec					Bloat Guard	
Region	Gain only	Bloat only	Both	Self-fed	Hand fed	Gain only	Bloat only	Both	Self-fed	Hand fed	Full season	High risk
Panhandle	27*	0*	73*	100	0	30	40	30	88	13	24*	76*
West Central	33	38	29	88	13	50	25	25	91	9	33	68
Southwest	12	53	35	88	13	30	22	48	81	19	46	54
North Central	25	31	44	64	36	42	11	47	75	25	50	50
Central	13	25	63	64	36	31	19	50	72	28	37	63
South Central-East	46	31	23	88	13	29	29	43	50	50	39	61
State	26	32	42	81	19	36	22	42	78	22	39	61

* Example: In Panhandle region, respondents fed Rumensin to increase gain only 27% of the time, to decrease bloat only 0% of the time and for both reasons 73% of the time. In the same region, respondents fed Bloat Guard during full season 24% of the time and during high bloat risk periods 76% of the time.

Table 45. Average beginning weights, rates of gain, and stocking rates of cattle in graze-out period.

Region	Beginning Weight Steers (lb)	Beginning Weight Heifers (lb)	Rate of Gain Steers (lb/day)	Rate of Gain Heifers (lb/day)	Stocking Rate Steers (acres/hd)	Stocking Rate Heifers (acres/hd)	Stocking Rate Cows with Fall Calves (acres/hd)	Stocking Rate Cows with Spring calves (acres/hd)	Stocking Rate Cows only (acres/hd)
Panhandle	543*	526*	2.2*	2.3*	1.2*	1.6*	2.3*	2.8**	1.5**
West Central	532	520	2.4	2.3	1.1	1.1	1.8**	1.7*	1.6**
Southwest	568	508	2.6	2.5	1.2	1.1	2.2*	1.9*	1.0**
North Central	614	568	2.4	2.3	1.1	1.0	2.4**	1.9**	†
Central	569	543	2.5	2.3	1.1	1.1	2.4*	2.1*	1.0**
South Central-East	486	484	2.1	1.9	1.5	1.7*	2.9**	3.2**	4.0**
State	556	526	2.4	2.2	1.2	1.2	2.3	2.2	1.7**

† No response
* Less than 25 observations used to calculate.
** Less than 15 observations used to calculate.

Table 46. When the percentage of total wheat acres to be grazed-out were determined (%).

Region	Prior To Planting	At End of Fall-winter Grazing	At Planting	During Fall-winter Grazing Season	Other
Panhandle	38	21	8	25	8
West central	32	11	10	46	3
Southwest	35	14	12	33	6
North Central	29	17	10	40	4
Central	47	10	6	36	1
South Central-East	55	9	9	22	6
State	39	13	9	35	4

Table 47. Factors that influenced the decision of number of acres to be grazed-out each year (%).

	Cattle prices			Wheat prices			Available capital to purchase cattle			Lack of moisture			Hail or high winds			Cheat			Crop rotation			Income from pasture leasing			Other		
Region	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3
Panhandle	22*	30*	7*	32	35	14	2	2	10	16	13	31	0	0	5	6	6	14	12	6	14	8	6	2	2	4	2
West Central	22	32	19	56	28	7	0	4	5	3	3	11	0	0	0	9	12	29	0	6	17	5	11	4	4	4	8
Southwest	30	32	11	43	37	8	0	1	12	9	11	26	0	0	1	4	7	22	7	5	12	3	3	5	5	3	3
North Central	23	30	13	34	36	20	0	0	2	1	1	8	0	1	0	23	14	35	8	9	13	6	8	3	6	1	5
Central	38	29	15	31	31	18	1	8	12	5	11	10	0	1	1	8	16	22	6	1	12	3	0	3	9	2	6
South Central-East	37	22	18	25	29	16	4	5	16	9	20	9	0	2	0	1	9	18	5	3	16	0	9	5	18	2	2
State	29	30	14	38	33	13	1	3	9	7	9	16	0	1	1	9	11	24	6	5	14	4	6	4	8	3	5

* Example: Cattle prices received 22% of all number one counts (most important), 30% of all number two counts and 7% of all number three counts in the Panhandle region.

Table 48. Lease agreements for fall-winter wheat pasture grazing.

Region	Livestock Owner %	Wheat Producer %	Both %	Oral Lease %	Written Lease %	Average Acres	One-year Lease %	Multi-year Lease %	Average year of Multi-year Lease
Panhandle	35*	50*	15*	96	4	432	35	65	9.23
West Central	21	68	12	90	10	259	41	59	6.64
Southwest	24	67	9	83	17	321	28	72	8.00
North Central	26	62	12	89	11	325	52	48	8.25
Central	46	42	13	91	9	212	44	56	5.60
South Central-East	30	50	20	91	9	297	21	79	6.87
State	29	58	13	90	10	303	38	63	7.42

* Example: In the Panhandle region, 35% of the respondents were the livestock owner, 50% were the wheat producer and 15% were both.

Table 49. Average wheat pasture rental price for fall-winter grazing.

Region	Observations	$/acre/ year	Observations	$/cwt/ month	Observations	$/lb of gain	Observations	$/head/ month
Panhandle	1	60	15	2.58	13	0.32	1	10.00
West Central	0	†	18	2.77	15	0.32	5	10.00
Southwest	0	†	8	2.44	20	0.31	2	12.98
North Central	0	†	24	2.91	7	0.32	2	13.50
Central	2	27	9	2.72	11	0.33	1	15.00
South Central-East	3	18	4	2.88	10	0.32	1	10.00
State	6	28	78	2.74	76	0.32	12	11.50

† No Response.

Table 50. Average wheat pasture rental price for graze-out acreage.

Region	Observations	$/acre/ year	Observations	$/cwt/ month	Observations	$/lb of gain	Observations	$/head/ month
Panhandle	5	61	5	2.90	9	0.34	0	†
West Central	16	85	3	2.83	13	0.32	2	11.50
Southwest	9	76	2	2.75	14	0.31	1	9.00
North Central	7	75	5	2.85	9	0.33	1	15.00
Central	6	68	4	2.88	10	0.32	0	†
South Central-East	4	49	1	2.50	10	0.32	0	†
State	47	74	20	2.84	65	0.32	4	11.75

† No Response.

Table 51. Livestock owner and wheat producer responsibilities under the wheat pasture grazing lease agreement. (%)

Region	Checking livestock			Salt & Minerals			Fencing Materials			Fencing Labor			Fertilizer Cost			Supplemental Feeding			Supplemental Pasture			Water		
	L†	W†	B†	L	W	B	L	W	B	L	W	B	L	W	B	L	W	B	L	W	B	L	W	B
Panhandle	69*	19*	13*	74	26	0	34	59	6	38	59	3	10	87	3	71	19	10	50	43	7	19	71	10
West Central	72	15	13	78	20	2	22	67	11	26	67	7	16	72	12	78	22	0	63	34	3	29	69	2
Southwest	53	24	24	58	26	16	13	76	11	14	75	11	8	87	5	54	37	9	50	43	7	11	81	8
North Central	66	24	10	76	18	5	40	55	5	42	50	8	3	88	10	70	24	5	48	45	6	13	79	8
Central	62	28	10	76	24	0	32	61	7	39	57	4	29	64	7	70	30	0	50	50	0	26	67	7
South Central-East	58	21	21	52	29	19	10	65	25	24	52	24	5	82	14	45	35	20	41	41	18	21	53	26
State	64	21	15	70	23	6	26	64	10	30	61	8	11	80	8	67	27	6	52	42	6	20	71	9

† L = Livestock Owner; W = Wheat Producer; B = Both.

* Example: In the Panhandle region, the responsibility of checking livestock was allocated to the livestock owner 69% of the time, to the wheat producer 19% of the time and to both 13% of the time.

Appendix

Dear Producer:

Information requested in this survey will be used by Oklahoma State University and the Oklahoma Agricultural Statistics Service to support wheat production and wheat pasture grazing research programs. Please complete the questionnaire to the best of your ability and return in the enclosed postage paid envelope. Information provided will be confidential. Thank you for your assistance.

F. M. Epplin, Agricultural Economist — Barry L. Bloyd, State Statistician

1. In what county or counties do you farm? _____

2. How many total acres are included in your farming operation (cropland, pastureland, woodland, CRP, other land)?
   _____ acres

3. Of these total acres how many do you:
   - ☐ own? _____ acres
   - ☐ lease? _____ acres

4. Are you a member of? (Check all that apply.)
   - ☐ Oklahoma Wheat Growers Association
   - ☐ Oklahoma Grain and Stocker Producers
   - ☐ Oklahoma Cattlemen's Association

5. How many acres of wheat did you plant in the Fall of 1999?

6. Did you plant any other crop with the wheat, such as rye or ryegrass? ☐ yes ☐ no
   If yes, what else did you plant with the wheat? _____
   On how many of your wheat acres did you use this combination?

7. Rank the following **characteristics** in order of importance when determining the varieties you plant. (Please rank the top **three** (1, 2, 3) with **1** being most important and leave the rest blank.)

__ forage yield	__ grain yield	__ aluminum or low pH tolerance
__ test weight	__ coleoptile length	__ winter hardiness
__ drought tolerance	__ late frost tolerance	__ insect resistance
__ height of plant	__ past success	__ disease resistance
__ maturity	__ pedigree (parentage)	__ shattering reputation
__ lodging	__ milling & baking quality	__ other (specify)

8. Rank the following **sources of information** as to their importance when selecting which variety of wheat to plant. (Please rank the top **three** (1, 2, 3) with **1** being most important and leave the rest blank.)

__ extension test plot results	__ results of neighboring fields	__ seed availability
__ past performance on my farm	__ research publications	__ county extension service
__ seed company information	__ other (specify)	

9. Which of the following best describes your understanding of what the term "first hollow stem" means in reference to wheat production? (Please check one.)
   - ☐ growth stage when I can feel a joint or node above the soil surface
   - ☐ growth stage where the developing head is at or above the soil surface
   - ☐ growth stage when hollow stem can first be identified above the roots
   - ☐ I am not familiar with what "first hollow stem" means

10. Based on the following definitions, how many of your 1999-2000 wheat acres were **planted** for each purpose:

_____ acres **Grain Only.** Never intended to graze the wheat.
_____ acres **Forage Only**. Planned to use only for grazing and/or hay with no grain harvest intended.
_____ acres **Dual-Purpose** Forage plus Grain. Planned to graze in the fall and winter and harvest the grain.

11. How many acres of your 1999-2000 wheat crop will actually be **used** for each purpose?

Grain Only _____ acres **Forage Only** _____ acres **Dual-Purpose** _____ acres

12. This item deals with the variation of production practices according to **intended use** of the wheat acreage. Please complete the information for each of the uses identified in item **10**. Complete all columns that apply to your operation.

		Grain Only	Forage Only	Dual-Purpose
a.	Seeding rate (**lbs/acre**)	_____	_____	
b.	Planting dates:			
	target planting date	_____	_____	
	actual 1999 planting date	_____	_____	
c.	Variety(s) planted	_____	_____	
		_____	_____	_____
		_____	_____	
d.	Fertilizer Used (**lbs/acre**)	(Include all fertilizer applied: preplant, with drill, and topdress.)		
	anhydrous ammonia (82-0-0)	_____	_____	
	ammonium nitrate (33-0-0)	_____	_____	
	urea (46-0-0)	_____	_____	
	liquid nitrogen (28-0-0)	_____	_____	
	diammonium phosph (18-46-0)	_____	_____	
	other _____	_____	_____	

13. How frequently do you soil test? (Please check one.)
☐every year ☐every 2 years ☐ every 3 years ☐ seldom or never ☐ other

This section of the survey deals with aspects of your fall/winter grazing program. If you did not graze small grain in the 1999-2000 season please skip to item 32.

14. What species of livestock did you graze on 1999-2000 wheat pasture? (Please check all that apply.)
☐ stocker cattle ☐ cows and/or replacement heifers ☐ sheep
☐ dairy cattle ☐ horses ☐ other

15. Which of the following best describes your 1999-2000 fall/winter operation?

	Average Beginning Weight	Stocking Rate	Rate of Gain (lbs/day)
☐ stocker steers	_____lbs	____ acres/steer	
☐ stocker heifers	_____lbs	____ acres/heifer	
☐ cows with fall calves		____ acres/cow	
☐ cows with spring calves		____ acres/cow	
☐ cows only		____ acres/cow	
☐ other _____		____ acres/animal	

16. If you purchased stocker cattle for fall/winter grazing, in what month were they purchased?
☐Jul ☐Aug ☐Sep ☐Oct ☐Nov ☐Dec ☐ Other months

17. Do you usually mass medicate stockers with an antibiotic after purchase and before placement on wheat? ☐yes ☐no

18. Did you use a receiving diet (either your own or a commercial one) for stocker cattle that you purchased? (Check one.)
- ☐ yes, my own receiving diet _____ days at _____$/head
- ☐ yes, a commercial receiving diet _____ days at _____$/head
- ☐ no, I purchased my cattle pre-conditioned
- ☐ no, I didn't use a receiving diet

19. Which of the following best describes your feeding program during receiving? (Please check only one box.)
- ☐ grass hay alone
- ☐ alfalfa hay alone
- ☐ grass hay plus a high-protein supplement
- ☐ grass hay plus a high-energy supplement
- ☐ alfalfa hay plus high-energy supplement
- ☐ silage
- ☐ silage plus supplement
- ☐ a complete mixed ration that is a self-fed
- ☐ a complete mixed ration that is hand-fed daily
- ☐ other

20. How many days do you typically have purchased stockers on the farm before placing them on wheat? ___ days

21. How did you determine when to begin grazing your wheat pasture? (Please check only one box.)
- ☐ calendar date of _____
- ☐ after root system was "anchored"
- ☐ visual assessment of top growth
- ☐ recommendation of others
- ☐ climate conditions
- ☐ other

22. Which of the following best describes the type of supplement that you fed to **cows** and/or **stockers** on wheat pasture? (Check all that apply. Use the left column for cows and right column for stockers.)

Cows	**Stockers**	
☐	☐	none
☐	☐	hay
☐	☐	protein supplement
☐	☐	liquid supplement
☐	☐	high-starch (grain-based) energy supplement
☐	☐	wheat straw and/or other low-quality roughage
☐	☐	high-fiber (i.e. wheat middling, soybean hull, etc.) energy supplement
☐		a mineral supplement (Please check the mineral of primary concern.) ☐calcium ☐phosphorus ☐magnesium ☐
	☐	a mineral supplement (Please check the mineral of primary concern.) ☐calcium ☐phosphorus ☐magnesium ☐
☐	☐	other _____

23. What is the primary reason that you fed a supplement to **stocker** cattle on wheat pasture? (Please rank the top **three** (1, 2, 3) with **1** being most important and leave the rest blank.)
- __ to provide supplemental nutrients such as minerals
- __ to provide additional roughage
- __ to increase stocking density during the fall/winter grazing
- __ to provide additional energy
- __ to maintain an ideal average daily gain
- __ other

24. Did you feed any of the following additives to **stocker** cattle on wheat pasture? (Please check all that apply.)

☐ Rumensin (monensin)	☐ to increase gain	☐ to decrease bloat	☐ self fed	☐ hand fed
☐ Bovatec (lasalocid)	☐ to increase gain	☐ to decrease bloat	☐ self fed	☐ hand fed
☐ Bloat Guard (poloxalene)	☐ during full season	☐ during high bloat risk periods		

25. What is the primary health problem of stockers after placement on wheat pasture? (Please check one.)
☐ bloat ☐ respiratory disease ☐ foot rot ☐ polioencephalomalacia ☐ other

26. What is the typical (a) **total death loss** of wheat pasture stockers on your farm? ___ % (b) Death **loss** from **bloat**? __%

27. How do you determine when to terminate fall/winter grazing? (Please check only one box.)
- ☐ calendar date
- ☐ first hollow stem stage of grazed wheat
- ☐ first hollow stem stage of ungrazed wheat
- ☐ recommendation of someone else
- ☐ other

28. What calendar date did you remove the livestock from the wheat that you plan to harvest for grain?

This section of the survey deals with aspects of grazing during the graze-out period. If you are not grazing-out small grain in 2000 please skip to item 32.

29. Which best describes your graze-out operation?

	Average Beginning Graze-out Weight	Graze-out Stocking Rate	Graze-out Rate of Gain (lbs/day)
☐ stocker steers	_____lbs	____ acres/steer	
☐ stocker heifers	_____lbs	____ acres/heifer	
☐ cows with fall calves		____ acres/cow	
☐ cows with spring calves		____ acres/cow	
☐ cows only		____ acres/cow	
☐ other _____		____ acres/animal	

30. At what point in the season did you determine the percentage of your total wheat acres that would be grazed out?
☐ prior to planting ☐ when livestock were removed from fall/winter pasture
☐ at planting ☐ during the fall/winter grazing season ☐ other

31. Rank the top three factors that influence your decision on how many, if any, acres you graze-out each year. (Please rank the top **three** (1, 2, 3) with **1** being most important and leave the rest blank)
__ cattle prices __ wheat prices __ available capital to purchase cattle
__ lack of moisture __ hail or high winds __ cheat
__ crop rotation __ income from pasture leasing __ other _____

The following items deal with lease arrangements for wheat pasture grazing. If you did not rent or lease wheat pasture then go to item 36.

32. If you were involved in wheat pasture rental then please answer the following items concerning your most typical fall/winter grazing lease. If you did not rent or lease wheat pasture then go to item 36.
For this agreement, (check one for each item)
a. you are ☐ livestock owner ☐ wheat producer How many acres are under this agreement? _____ acres
b. the lease is ☐ oral ☐ written How many years have these acres been leased? _____ years

33. The most recent rental price for fall/winter grazing was/is (Complete one blank with appropriate units.)
a. $/acre/year $_____ b. $/acre/month $
c. $/cwt/month $_____ d. $/lb of gain $
e. $/head/month $_____ f. other _____ $

34. Under the price you gave in the previous item, who is responsible for the following services? (Check all that apply.)

	Livestock Owner	Wheat Producer	Both		Livestock Owner	Wheat Producer	Both
a. checking livestock	☐	☐	☐	b. salt and minerals	☐	☐	☐
c. fencing materials	☐	☐	☐	d. fencing labor	☐	☐	☐
e. fertilizer cost	☐	☐	☐	f. supplemental feeding	☐	☐	☐
g. supplemental pasture	☐	☐	☐	h. water	☐	☐	☐
i. other _____	☐	☐	☐				

35. The most recent rental price for graze-out acreage was/is (Complete one blank with appropriate units.)
a. $/acre/year $_____ b. $/acre/month $
c. $/cwt/month $_____ d. $/lb of gain $
e. $/head/month $_____ f. other_____ $

36. Thank you for your cooperation. In the space provided below, or on a separate sheet, please provide your ideas concerning what research topics in the area of wheat production and wheat pasture grazing should be given highest priority.

Oklahoma State University
Dept of Ag Economics
Stillwater OK 74078

Oklahoma Agricultural Statistics
PO Box 528804
Oklahoma City OK 73152

Dear Operator:

Last week you were mailed a questionnaire seeking information regarding wheat pasture grazing practices. Your name was selected at random from among all livestock producers in the state. The information you provide will be kept absolutely confidential and aid in research programs at O.S.U.

If you have already completed the questionnaire and returned it to us, please accept our thanks. If you have not completed the questionnaire, please take a few minutes and do so today.

Sincerely yours,

Francis M. Epplin, Professor
Agricultural Economics Department
405-744-7126

Barry L. Bloyd
State Statistician
405-522-6190


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