Bermudagrass Pasture - Established Stand

Crop Highlights
• Shade from weeds is often the greatest danger so graze close • Begins growth late in spring • Tolerates heat and drought • Can graze with intensive grazing management • For winter grazing, over-seed with annual or Italian ryegrass in Sept.

Yield Goal

A specific yield goal is not utilized for pastures. The goal of these recommendations is to ensure good pasture performance to meet the needs of livestock being grazed there.

Target pH: 6.5

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
Soil Test Mg between 50 and 100 FIVs AND LESS than Soil Test Ca	Dolomitic
Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. An initial application of 40 - 60 lbs N/ac should be applied when growth begins in mid- to late spring, followed by additional N in early June as needed.
2. If forage growth is slow or inadequate for livestock needs, apply 40 - 60 lbs N/ac to encourage recovery and regrowth. Repeat application when needed.
3. Adjust the N application rate as productivity changes from one grazing cycle to the next and with expected weather conditions.

Phosphorus

Table 2. Recommended phosphorus fertilizer rate to promote adequate pasture performance and productivity.

	UD FIVs										
Fertilizer	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs P_2O_5/ac	120	100	90	70	60	50	40	20	0	0	0

1. If soil test P is “Low” (e.g., 25 FIVs or less), satisfactory growth is unlikely. The grazing manager should evaluate the stand density to decide if replanting is appropriate since broadcasting and

plowing down the recommended rate of P_2O_5 will produce higher yields sooner than will topdress applications.

2. If soil test P is “Medium” or “Optimum” (e.g., 26 to 100 FIVs), topdress phosphorus after the first grazing cycle.
3. If soil test P is “Excessive” (e.g., P-FIV’s >100), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED.

Potassium

Table 3. Recommended potassium fertilizer rate to promote adequate pasture performance and productivity.

	UD FIVs										
Fertilizer	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs K_2O/ac	180	165	150	135	120	105	90	75	60	45	0

1. Topdress potash in mid-May to mid-June.
2. Application rates of 120 lbs K_2O /ac or higher should be split into two treatments. Apply ½ of the recommended rate from mid-May to mid-June and the remainder in August or early September.

Magnesium

1. Magnesium is recommended when Soil Test Magnesium is less than 38 FIVs
2. If Soil Test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
3. If Soil Test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

	UD FIVs								
Soluble Mg	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

1. Monitor forage for sulfur deficiency or use ammonium sulfate as an N source to supply needed S.
2. If deficiency symptoms occur, contact your county agent for assistance with diagnosis and/or corrective recommendations.
3. Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.

Manganese

Manganese (Mn) needs are predicted by an Availability Index that includes M3 soil test Mn and soil pH. Interpretation is crop specific.

$$MnAI = 101.7 – (15.2 \times \text{soil pH}) + (2.11 \times \text{M3-Mn})$$

Where:

MnAI = Mn availability index
Soil pH = Soil pH measured in water (1:1 V:V)
M3-Mn = Mehlich 3 soil test Mn in lbs/ac

Table 5. Interpretation of Mn availability index.

Mn Availability Index	Interpretation
Less than 12	Mn deficiency is possible. Monitor the crop for symptoms
12 or greater	Mn deficiency is unlikely.

1. If Mn deficiency is predicted or was observed in the previous growing season, broadcast 20-40 lbs actual Mn/ac..
2. Broadcast applications of acid forming fertilizers may correct Mn deficiency without the actual application of Mn in some cases, but may be less effective than applications of Mn.
3. If Mn deficiency symptoms appear during the growing season or after an application of lime, a foliar application of 0.5 to 2.0 lbs/ac actual Mn as Mn sulfate or chelated Mn can alleviate the symptoms and restore yield potential. ***Apply only when adequate growth is present to aid absorption of foliar Mn***.

Zinc

Zinc (Zn) deficiency is predicted by an Availability Index that includes not only M3 soil test Zn, but also soil pH and M3 soil test P.

Table 6. Interpretation of Zn availability index.

Soil Test Criteria	Interpretation
M3-Zn is less than 1.9 lbs/ac	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac **AND** soil pH is higher than 7.0	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac **AND** soil pH is 6.6 or higher **AND** M3-P is 100 FIVs or higher	Zn deficiency is predicted
M3-Zn is 3.2 lbs/ac or higher	Soil should be sufficient in Zn

If zinc deficiency is predicted by the availability index or was observed the previous year, one of the following treatments can be applied:

1. Broadcast 10-12 lbs/ac actual Zn as Zn sulfate or Zn oxide. Broadcast applications should correct Zn deficiency for several years.
2. Foliar application of 1 lb/ac actual Zn as Zn sulfate or Zn oxide or 0.5 lb/ac actual Zn as Zn chelate in 20 to 50 gallons of water. ***Apply only when adequate growth is present to aid absorption of foliar Zn.*** Application should be repeated if symptoms re-appear.

Boron

1. Boron (B) deficiency is not common in warm season grass pastures. If symptoms are observed in the field, contact your county agent for assistance with diagnosis and corrective treatments.

Big Bluestem Pasture - Established Stand

Crop Highlights
• A native warm-season grass with good to excellent palatability • Intermediate in maturity (heads in mid-summer) • Rotational grazing is mandatory to maintain stand life

Yield Goal

A specific yield goal is not utilized for pastures. The goal of these recommendations is to ensure good pasture performance to meet the needs of livestock being grazed there.

Target pH: 6.2

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
Soil Test Mg between 50 and 100 FIVs AND LESS than Soil Test Ca	Dolomitic
Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. An initial application of 40 - 60 lbs N/ac should be applied when growth begins in mid- to late spring, followed by additional N in early June as needed.
2. If forage growth is slow or inadequate for livestock needs, apply 20 - 40 lbs N/ac to encourage recovery and regrowth. Repeat application when needed.
3. Adjust the N application rate as productivity changes from one grazing cycle to the next and with expected weather conditions.

Phosphorus

Table 2. Recommended phosphorus fertilizer rate to promote adequate pasture performance and productivity.

	UD FIVs										
Fertilizer	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs P_2O_5/ac	120	100	90	70	60	50	40	20	0	0	0

1. If soil test P is “Low” (e.g., 25 FIVs or less), satisfactory growth is unlikely. The grazing manager should evaluate the stand density to decide if replanting is appropriate since broadcasting and plowing down the recommended rate of P_2O_5 will produce higher yields sooner than will topdress applications.

2. If soil test P is “Medium” or “Optimum” (e.g., 26 to 100 FIVs), topdress phosphorus after the first grazing cycle.
3. If soil test P is “Excessive” (e.g., P-FIV’s >100), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED.

Potassium

Table 3. Recommended potassium fertilizer rate to promote adequate pasture performance and productivity.

	UD FIVs										
Fertilizer	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs K_2O/ac	180	165	150	135	120	105	90	75	60	45	0

1. Topdress potash in mid-May to mid-June.
2. Application rates of 120 lbs K_2O /ac or higher should be split into two treatments. Apply ½ of the recommended rate from mid-May to mid-June and the remainder in August or early September.

Magnesium

1. Magnesium is recommended when Soil Test Magnesium is less than 38 FIVs
2. If Soil Test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
3. If Soil Test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

	UD FIVs								
Soluble Mg	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

1. Monitor forage for sulfur deficiency or use ammonium sulfate as an N source to supply needed S.
2. If deficiency symptoms occur, contact your county agent for assistance with diagnosis and/or corrective recommendations.
3. Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.

Manganese

Manganese (Mn) needs are predicted by an Availability Index that includes M3 soil test Mn and soil pH. Interpretation is crop specific.

$$MnAI = 101.7 – (15.2 \times \text{soil pH}) + (2.11 \times \text{M3-Mn})$$

Where:

MnAI = Mn availability index
Soil pH = Soil pH measured in water (1:1 V:V)

M3-Mn = Mehlich 3 soil test Mn in lbs/ac

Table 5. Interpretation of Mn availability index.

Mn Availability Index	Interpretation
Less than 12	Mn deficiency is possible. Monitor the crop for symptoms
12 or greater	Mn deficiency is unlikely.

1. If Mn deficiency is predicted or was observed in the previous growing season, broadcast 20-40 lbs actual Mn/ac..
2. Broadcast applications of acid forming fertilizers may correct Mn deficiency without the actual application of Mn in some cases, but may be less effective than applications of Mn.
3. If Mn deficiency symptoms appear during the growing season or after an application of lime, a foliar application of 0.5 to 2.0 lbs/ac actual Mn as Mn sulfate or chelated Mn can alleviate the symptoms and restore yield potential. ***Apply only when adequate growth is present to aid absorption of foliar Mn***.

Zinc

Zinc (Zn) deficiency is predicted by an Availability Index that includes not only M3 soil test Zn, but also soil pH and M3 soil test P.

Table 6. Interpretation of Zn availability index.

Soil Test Criteria	Interpretation
M3-Zn is less than 1.9 lbs/ac	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac **AND** soil pH is higher than 7.0	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac **AND** soil pH is 6.6 or higher **AND** M3-P is 100 FIVs or higher	Zn deficiency is predicted
M3-Zn is 3.2 lbs/ac or higher	Soil should be sufficient in Zn

If zinc deficiency is predicted by the availability index or was observed the previous year, one of the following treatments can be applied:

1. Broadcast 10-12 lbs/ac actual Zn as Zn sulfate or Zn oxide. Broadcast applications should correct Zn deficiency for several years.
2. Foliar application of 1 lb/ac actual Zn as Zn sulfate or Zn oxide or 0.5 lb/ac actual Zn as Zn chelate in 20 to 50 gallons of water. ***Apply only when adequate growth is present to aid absorption of foliar Zn.*** Application should be repeated if symptoms re-appear.

Boron

1. Boron (B) deficiency is not common in warm season grass pastures. If symptoms are observed in the field, contact your county agent for assistance with diagnosis and corrective treatments.

Eastern Gamagrass Pasture - Established Stand

Crop Highlights
• Performs best if first harvest is taken as hay (large round bales) and regrowth is grazed • Rest period between grazing cycles of 45 days is about optimum • To maintain a minimum stubble height of 6 to 8 inches, grazing should be halted at a considerably higher height • Keep grazing periods relatively short or animals will graze new regrowth • Herbage is often coarse but palatability is excellent • Allow a minimum of a 45 day rest before the first killing frost

Yield Goal

A specific yield goal is not utilized for pastures. The goal of these recommendations is to ensure good pasture performance to meet the needs of livestock being grazed there.

Target pH: 6.5

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
Soil Test Mg between 50 and 100 FIVs AND LESS than Soil Test Ca	Dolomitic
Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. An initial application of 40 - 60 lbs N/ac should be applied when growth begins in early spring, followed by additional N in early June as needed.
2. If forage growth is slow or inadequate for livestock needs, apply 40 - 60 lbs N/ac to encourage recovery and regrowth. Repeat application when needed.
3. Adjust the N application rate as productivity changes from one grazing cycle to the next and with expected weather conditions.

Phosphorus

Table 2. Recommended phosphorus fertilizer rate to promote adequate pasture performance and productivity.

	UD FIVs										
Fertilizer	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs P_2O_5/ac	120	100	90	70	60	50	40	20	0	0	0

1. If soil test P is “Low” (e.g., 25 FIVs or less), satisfactory growth is unlikely. The grazing manager should evaluate the stand density to decide if replanting is appropriate since broadcasting and plowing down the recommended rate of P_2O_5 will produce higher yields sooner than will topdress applications.
2. If soil test P is “Medium” or “Optimum” (e.g., 26 to 100 FIVs), topdress phosphorus after the first grazing cycle.
3. If soil test P is “Excessive” (e.g., P-FIV’s >100), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED.

Potassium

Table 3. Recommended potassium fertilizer rate to promote adequate pasture performance and productivity.

	UD FIVs										
Fertilizer	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs K_2O/ac	180	165	150	135	120	105	90	75	60	45	0

1. Topdress potash in mid-May to mid-June.
2. Application rates of 120 lbs K_2O /ac or higher should be split into two treatments. Apply ½ of the recommended rate from mid-May to mid-June and the remainder in August or early September.

Magnesium

1. Magnesium is recommended when Soil Test Magnesium is less than 38 FIVs
2. If Soil Test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
3. If Soil Test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

	UD FIVs								
Soluble Mg	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

1. Monitor forage for sulfur deficiency or use ammonium sulfate as an N source to supply needed S.
2. If deficiency symptoms occur, contact your county agent for assistance with diagnosis and/or corrective recommendations.
3. Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.

Manganese

Manganese (Mn) needs are predicted by an Availability Index that includes M3 soil test Mn and soil pH. Interpretation is crop specific.

MnAI = 101.7 – (15.2 X soil pH) + (2.11 X M3-Mn)

Where:

MnAI = Mn availability index
Soil pH = Soil pH measured in water (1:1 V:V)
M3-Mn = Mehlich 3 soil test Mn in lbs/ac

Table 5. Interpretation of Mn availability index.

Mn Availability Index	Interpretation
Less than 12	Mn deficiency is possible. Monitor the crop for symptoms
12 or greater	Mn deficiency is unlikely.

1. If Mn deficiency is predicted or was observed in the previous growing season, broadcast 20-40 lbs actual Mn/ac..
2. Broadcast applications of acid forming fertilizers may correct Mn deficiency without the actual application of Mn in some cases, but may be less effective than applications of Mn.
3. If Mn deficiency symptoms appear during the growing season or after an application of lime, a foliar application of 0.5 to 2.0 lbs/ac actual Mn as Mn sulfate or chelated Mn can alleviate the symptoms and restore yield potential. ***Apply only when adequate growth is present to aid absorption of foliar Mn***.

Zinc

Zinc (Zn) deficiency is predicted by an Availability Index that includes not only M3 soil test Zn, but also soil pH and M3 soil test P.

Table 6. Interpretation of Zn availability index.

Soil Test Criteria	Interpretation
M3-Zn is less than 1.9 lbs/ac	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac **AND** soil pH is higher than 7.0	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac **AND** soil pH is 6.6 or higher **AND** M3-P is 100 FIVs or higher	Zn deficiency is predicted
M3-Zn is 3.2 lbs/ac or higher	Soil should be sufficient in Zn

If zinc deficiency is predicted by the availability index or was observed the previous year, one of the following treatments can be applied:

1. Broadcast 10-12 lbs/ac actual Zn as Zn sulfate or Zn oxide. Broadcast applications should correct Zn deficiency for several years.
2. Foliar application of 1 lb/ac actual Zn as Zn sulfate or Zn oxide or 0.5 lb/ac actual Zn as Zn chelate in 20 to 50 gallons of water. ***Apply only when adequate growth is present to aid absorption of foliar Zn.*** Application should be repeated if symptoms re-appear.

Boron

1. Boron (B) deficiency is not common in warm season grass pastures. If symptoms are observed in the field, contact your county agent for assistance with diagnosis and corrective treatments.

Indiangrass Pasture - Established Stand

Crop Highlights
• New stands may take two years before they can be grazed • Rotational grazing is mandatory to maintain stand life • Limit number of grazing cycles to maintain stand • Requires high stubble (at least minimum 6 to 8 inches) • There is potential for prussic acid (cyanide) poisoning with Indiangrass • Indiangrass, a native warm-season grass, heads late in the summer

Yield Goal

A specific yield goal is not utilized for pastures. The goal of these recommendations is to ensure good pasture performance to meet the needs of livestock being grazed there.

Target pH: 6.2

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
Soil Test Mg between 50 and 100 FIVs AND LESS than Soil Test Ca	Dolomitic
Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. An initial application of 40 - 60 lbs N/ac should be applied when growth begins in mid- to late spring, followed by additional N in early June as needed.
2. If forage growth is slow or inadequate for livestock needs, apply 20 - 40 lbs N/ac to encourage recovery and regrowth. Repeat application when needed.
3. Adjust the N application rate as productivity changes from one grazing cycle to the next and with expected weather conditions.

Phosphorus

Table 2. Recommended phosphorus fertilizer rate to promote adequate pasture performance and productivity.

	UD FIVs										
Fertilizer	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs P_2O_5/ac	120	100	90	70	60	50	40	20	0	0	0

1. If soil test P is “Low” (e.g., 25 FIVs or less), satisfactory growth is unlikely. The grazing manager should evaluate the stand density to decide if replanting is appropriate since broadcasting and plowing down the recommended rate of P_2O_5 will produce higher yields sooner than will topdress applications.
2. If soil test P is “Medium” or “Optimum” (e.g., 26 to 100 FIVs), topdress phosphorus after the first grazing cycle.
3. If soil test P is “Excessive” (e.g., P-FIV’s >100), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED.

Potassium

Table 3. Recommended potassium fertilizer rate to promote adequate pasture performance and productivity.

	UD FIVs										
Fertilizer	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs K_2O/ac	180	165	150	135	120	105	90	75	60	45	0

1. Topdress potash in mid-May to mid-June.
2. Application rates of 120 lbs K_2O /ac or higher should be split into two treatments. Apply ½ of the recommended rate from mid-May to mid-June and the remainder in August or early September.

Magnesium

1. Magnesium is recommended when Soil Test Magnesium is less than 38 FIVs
2. If Soil Test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
3. If Soil Test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

	UD FIVs								
Soluble Mg	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

1. Monitor forage for sulfur deficiency or use ammonium sulfate as an N source to supply needed S.
2. If deficiency symptoms occur, contact your county agent for assistance with diagnosis and/or corrective recommendations.
3. Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.

Manganese

Manganese (Mn) needs are predicted by an Availability Index that includes M3 soil test Mn and soil pH. Interpretation is crop specific.

MnAI = 101.7 – (15.2 X soil pH) + (2.11 X M3-Mn)

Where:

MnAI = Mn availability index
Soil pH = Soil pH measured in water (1:1 V:V)
M3-Mn = Mehlich 3 soil test Mn in lbs/ac

Table 5. Interpretation of Mn availability index.

Mn Availability Index	Interpretation
Less than 12	Mn deficiency is possible. Monitor the crop for symptoms
12 or greater	Mn deficiency is unlikely.

1. If Mn deficiency is predicted or was observed in the previous growing season, broadcast 20-40 lbs actual Mn/ac..
2. Broadcast applications of acid forming fertilizers may correct Mn deficiency without the actual application of Mn in some cases, but may be less effective than applications of Mn.
3. If Mn deficiency symptoms appear during the growing season or after an application of lime, a foliar application of 0.5 to 2.0 lbs/ac actual Mn as Mn sulfate or chelated Mn can alleviate the symptoms and restore yield potential. ***Apply only when adequate growth is present to aid absorption of foliar Mn***.

Zinc

Zinc (Zn) deficiency is predicted by an Availability Index that includes not only M3 soil test Zn, but also soil pH and M3 soil test P.

Table 6. Interpretation of Zn availability index.

Soil Test Criteria	Interpretation
M3-Zn is less than 1.9 lbs/ac	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac **AND** soil pH is higher than 7.0	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac **AND** soil pH is 6.6 or higher **AND** M3-P is 100 FIVs or higher	Zn deficiency is predicted
M3-Zn is 3.2 lbs/ac or higher	Soil should be sufficient in Zn

If zinc deficiency is predicted by the availability index or was observed the previous year, one of the following treatments can be applied:

1. Broadcast 10-12 lbs/ac actual Zn as Zn sulfate or Zn oxide. Broadcast applications should correct Zn deficiency for several years.
2. Foliar application of 1 lb/ac actual Zn as Zn sulfate or Zn oxide or 0.5 lb/ac actual Zn as Zn chelate in 20 to 50 gallons of water. ***Apply only when adequate growth is present to aid absorption of foliar Zn.*** Application should be repeated if symptoms re-appear.

Boron

1. Boron (B) deficiency is not common in warm season grass pastures. If symptoms are observed in the field, contact your county agent for assistance with diagnosis and corrective treatments.

Little Bluestem Pasture - Established Stand

Crop Highlights
• New stands may take two years before they can be grazed • Much shorter stature than other warm-season grasses and lower yielding • Rotational grazing is mandatory to maintain stand life

Yield Goal

A specific yield goal is not utilized for pastures. The goal of these recommendations is to ensure good pasture performance to meet the needs of livestock being grazed there.

Target pH: 6.2

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
Soil Test Mg between 50 and 100 FIVs AND LESS than Soil Test Ca	Dolomitic
Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. An initial application of 40 - 60 lbs N/ac should be applied when growth begins in mid- to late spring, followed by additional N in early June as needed.
2. If forage growth is slow or inadequate for livestock needs, apply 20 - 40 lbs N/ac to encourage recovery and regrowth. Repeat application when needed.
3. Adjust the N application rate as productivity changes from one grazing cycle to the next and with expected weather conditions.

Phosphorus

Table 2. Recommended phosphorus fertilizer rate to promote adequate pasture performance and productivity.

	UD FIVs										
Fertilizer	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs P_2O_5/ac	120	100	90	70	60	50	40	20	0	0	0

1. If soil test P is “Low” (e.g., 25 FIVs or less), satisfactory growth is unlikely. The grazing manager should evaluate the stand density to decide if replanting is appropriate since broadcasting and plowing down the recommended rate of P_2O_5 will produce higher yields sooner than will topdress applications.

2. If soil test P is “Medium” or “Optimum” (e.g., 26 to 100 FIVs), topdress phosphorus after the first grazing cycle.
3. If soil test P is “Excessive” (e.g., P-FIV’s >100), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED.

Potassium

Table 3. Recommended potassium fertilizer rate to promote adequate pasture performance and productivity.

	UD FIVs										
Fertilizer	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs K_2O/ac	180	165	150	135	120	105	90	75	60	45	0

1. Topdress potash in mid-May to mid-June.
2. Application rates of 120 lbs K_2O /ac or higher should be split into two treatments. Apply ½ of the recommended rate from mid-May to mid-June and the remainder in August or early September.

Magnesium

1. Magnesium is recommended when Soil Test Magnesium is less than 38 FIVs
2. If Soil Test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
3. If Soil Test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

	UD FIVs								
Soluble Mg	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

1. Monitor forage for sulfur deficiency or use ammonium sulfate as an N source to supply needed S.
2. If deficiency symptoms occur, contact your county agent for assistance with diagnosis and/or corrective recommendations.
3. Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.

Manganese

Manganese (Mn) needs are predicted by an Availability Index that includes M3 soil test Mn and soil pH. Interpretation is crop specific.

$$MnAI = 101.7 – (15.2 \times \text{soil pH}) + (2.11 \times \text{M3-Mn})$$

Where:

MnAI = Mn availability index
Soil pH = Soil pH measured in water (1:1 V:V)

M3-Mn = Mehlich 3 soil test Mn in lbs/ac

Table 5. Interpretation of Mn availability index.

Mn Availability Index	Interpretation
Less than 12	Mn deficiency is possible. Monitor the crop for symptoms
12 or greater	Mn deficiency is unlikely.

1. If Mn deficiency is predicted or was observed in the previous growing season, broadcast 20-40 lbs actual Mn/ac..
2. Broadcast applications of acid forming fertilizers may correct Mn deficiency without the actual application of Mn in some cases, but may be less effective than applications of Mn.
3. If Mn deficiency symptoms appear during the growing season or after an application of lime, a foliar application of 0.5 to 2.0 lbs/ac actual Mn as Mn sulfate or chelated Mn can alleviate the symptoms and restore yield potential. ***Apply only when adequate growth is present to aid absorption of foliar Mn***.

Zinc

Zinc (Zn) deficiency is predicted by an Availability Index that includes not only M3 soil test Zn, but also soil pH and M3 soil test P.

Table 6. Interpretation of Zn availability index.

Soil Test Criteria	Interpretation
M3-Zn is less than 1.9 lbs/ac	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac **AND** soil pH is higher than 7.0	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac **AND** soil pH is 6.6 or higher **AND** M3-P is 100 FIVs or higher	Zn deficiency is predicted
M3-Zn is 3.2 lbs/ac or higher	Soil should be sufficient in Zn

If zinc deficiency is predicted by the availability index or was observed the previous year, one of the following treatments can be applied:

1. Broadcast 10-12 lbs/ac actual Zn as Zn sulfate or Zn oxide. Broadcast applications should correct Zn deficiency for several years.
2. Foliar application of 1 lb/ac actual Zn as Zn sulfate or Zn oxide or 0.5 lb/ac actual Zn as Zn chelate in 20 to 50 gallons of water. ***Apply only when adequate growth is present to aid absorption of foliar Zn.*** Application should be repeated if symptoms re-appear.

Boron

1. Boron (B) deficiency is not common in warm season grass pastures. If symptoms are observed in the field, contact your county agent for assistance with diagnosis and corrective treatments.

Switchgrass Pasture - Established Stand

Crop Highlights
• Rotational grazing is mandatory to maintain stand life • Switchgrass greens up and matures earliest of the bluestems and Indiangrass • If the sole feed source for ruminants, switchgrass, a Panicum species, can cause liver lesions in ruminant species

Yield Goal

A specific yield goal is not utilized for pastures. The goal of these recommendations is to ensure good pasture performance to meet the needs of livestock being grazed there.

Target pH: 6.2

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
Soil Test Mg between 50 and 100 FIVs AND LESS than Soil Test Ca	Dolomitic
Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. An initial application of 40 - 60 lbs N/ac should be applied when growth begins in mid- to late spring, followed by additional N in early June as needed.
2. If forage growth is slow or inadequate for livestock needs, apply 20 - 40 lbs N/ac to encourage recovery and regrowth. Repeat application when needed.
3. Adjust the N application rate as productivity changes from one grazing cycle to the next and with expected weather conditions.

Phosphorus

Table 2. Recommended phosphorus fertilizer rate to promote adequate pasture performance and productivity.

	UD FIVs										
Fertilizer	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs P_2O_5/ac	120	100	90	70	60	50	40	20	0	0	0

1. If soil test P is “Low” (e.g., 25 FIVs or less), satisfactory growth is unlikely. The grazing manager should evaluate the stand density to decide if replanting is appropriate since broadcasting and

plowing down the recommended rate of P_2O_5 will produce higher yields sooner than will topdress applications.

2. If soil test P is “Medium” or “Optimum” (e.g., 26 to 100 FIVs), topdress phosphorus after the first grazing cycle.
3. If soil test P is “Excessive” (e.g., P-FIV’s >100), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED.

Potassium

Table 3. Recommended potassium fertilizer rate to promote adequate pasture performance and productivity.

	UD FIVs										
Fertilizer	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs K_2O/ac	180	165	150	135	120	105	90	75	60	45	0

1. Topdress potash in mid-May to mid-June.
2. Application rates of 120 lbs K_2O /ac or higher should be split into two treatments. Apply ½ of the recommended rate from mid-May to mid-June and the remainder in August or early September.

Magnesium

1. Magnesium is recommended when Soil Test Magnesium is less than 38 FIVs
2. If Soil Test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
3. If Soil Test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

	UD FIVs								
Soluble Mg	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

1. Monitor forage for sulfur deficiency or use ammonium sulfate as an N source to supply needed S.
2. If deficiency symptoms occur, contact your county agent for assistance with diagnosis and/or corrective recommendations.
3. Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.

Manganese

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