An Evaluation of Supplemental Plantings for White-tailed Deer in the Georgia Piedmont

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Abstract: In the southeastern United States, supplemental plantings often are used to increase forage availability and quality. We evaluated production and utilization by white-tailed deer (*Odocoileus virginianus*) of 3 warm-season and 8 cool-season agricultural forages in Madison, Morgan, and Putnam counties, Georgia. Eight 0.1-ha food plots were planted with cool-season forages at 3 locations in October 1991. Three warm-season forage species were planted at 3 locations in May 1992. Forage production and utilization were measured every 29 ± 3 days. Aeschynomene (*Aeschynomene americana*) and alyceclover (*Alysicarpus vaginalis*) were productive and highly utilized warm-season forages. Among cool-season forages, wheat had the highest monthly production from January through April. Ladino clover (*Trifolium repens*) had the highest monthly production and utilization from May through December. All forages except small burnet (*Sanguisorba minor*) maintained crude protein levels exceeding 16%. Agricultural forages that performed best were competitive with weeds, tolerated dry weather during establishment, and recovered from intense utilization during early growth stages.

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In the southeastern United States, late summer and late winter can be nutritionally stressful to deer (Dietz 1965; Lay 1969; Segelquist et al. 1971; Short et al. 1975; Blair et al. 1977, 1980; Johnson et al. 1987). In a Texas study, Blair and Halls (1968) showed that from summer through winter, crude protein and phosphorus contents of browse plants in a pine-hardwood timber stand seldom exceed maintenance requirements of deer. Food plots can improve food availability and supplement nutrition during these critical periods (Larson 1969, Crawford 1984).

Supplemental plantings include cool-season perennial legumes such as ladino clover, subterranean clover (*Trifolium subterraneum*), and alfalfa (*Medicago sativa*), warm-season annual legumes such as cowpeas (*Vigna unguiculata*),

and small grains such as wheat, oats, rye, and ryegrass. Understanding performance and preference of various forages is essential in meeting the challenges of intensively managing deer populations. We evaluated production, utilization, and seasonal crude protein levels of 8 cool-season and 3 warm-season agricultural plantings in the Piedmont of Georgia.

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Methods

Study sites were located in Madison, Morgan, and Putnam counties in the Piedmont physiographic region of Georgia. Soils ranged from somewhat poorly-drained loamy alluvial soils to deep, well-drained fine sandy loams. Deer densities were estimated at 12–15 deer/km^2 in Madison and Morgan counties and 15–19 deer/km^2 in Putnam County (Ga. Dep. Nat. Resour., unpubl. data 1988).

Three warm-season forage species, aeschynomene, pigeon peas (*Cajanus cajan*), and alyceclover, were evaluated during summer 1992. Eight cool-season forage species were planted in October 1991 and were sampled from January through December 1992. Cool-season test species were alfalfa, flat pea (*Lathyrus sylvestris*), hubam clover (*Melilotus alba annua*), regal ladino clover, cicer milkvetch (*Astragalus cicer*), sainfoin (*Onobrychis viciaefolia*), small burnet, and wheat.

Prior to planting, sites were limed and fertilized following soil test results. No additional fertilizer or herbicides were applied during this study. Warm-season experimental plots consisted of a 0.30-ha site divided into 3 sections (0.10 ha each). Each species was assigned randomly to 1 section. Similarly, for the cool-season experimental plots, a 0.80-ha clearing was divided into 8 0.10-ha sections. Prior to planting, all legumes were inoculated with a *Rhizobium* spp. inoculant. Seed was broadcast at recommended seeding rates (Pennington 1985).

After planting, 3 browse exclosures (0.5 m^2 each) were placed randomly within each 0.10-ha section. Exclosures were made of 5 x 10 cm welded wire and were 1.2 m in height. Sampling warm-season species began approximately 30 days after planting and for cool-season species, 90 days after planting. All forage inside each exclosure was clipped every 29 days (±3 days). An equal size area outside of each exclosure also was clipped. After clipping, each exclosure was placed randomly at a different site within the 0.10-ha section.

Samples were oven-dried at approximately 100 C. Dry weights of samples from inside exclosures provided estimates of standing crop. Dry weights from inside each exclosure minus dry weights outside the exclosure the previous month provided estimates of production for the sampling period. Difference in

dry weight inside and outside the exclosures during the same sampling period was used to estimate utilization.

Samples of each test species collected from inside exclosures were analyzed for crude protein (CP) following Issac and Johnson (1976). Analysis of variance was used to compare standing crop, production, and utilization among species within sites. Duncan's Multiple Range Test was used to compare treatment means at $P \leq 0.10$. Statistical analysis was made using the PC version of the Statistical Analysis System (SAS Inst. 1982).

Results

Differences existed ($P \leq 0.10$) in standing crop, production, and utilization within species among sites. Therefore, data from different sites were not combined.

Aeschynomene and alyceclover, and aeschynomene and pigeon peas produced more forage than other warm-season species during July and September, respectively, at the Madison County study site (Table 1). The only difference in forage production at the Morgan County study site occurred in July, when aeschynomene and alyceclover produced more forage than pigeon peas. In Putnam County, alyceclover produced more forage than the other species during August.

Significantly more aeschynomene forage was utilized during July in Madison County. During July at the Morgan County study site, alyceclover and aeschynomene were utilized to a greater extent than pigeon peas; however, in August, alyceclover and pigeon peas were utilized more than aeschynomene. The only difference in forage utilization in Putnam County occurred in August when alyceclover was used more than either aeschynomene or pigeon peas.

All species had high mean CP levels from July through October (Table 2). Crude protein values for alyceclover and pigeon peas decreased throughout summer, whereas aeschynomene maintained high protein levels.

Of the cool-season plantings, flat pea and milkvetch failed to produce a stand at any study area. An extended period of drought immediately after planting likely contributed to these species' failure.

Wheat produced the most forage from January through April in Madison (Table 3) and Morgan (Table 4) counties, and for January through March in Putnam County (Table 5). During this period, small burnet produced more forage than other species. In May and June, small burnet and ladino clover produced more forage than other species over the 2 sampling periods. In October, ladino clover produced more forage than small burnet.

Other than wheat during the early portion of the study, few differences existed in forage production in Morgan County. Cody alfalfa produced more forage than small burnet, hubam clover, or sainfoin during July.

Wheat produced the most forage during January through March in Putnam County. In April, ladino clover, wheat, and small burnet had the highest mean

Table 1. Mean monthly production and utilization by white-tailed deer (kg/ha) of warm season forages established in Madison, Morgan, and Putnam counties, Georgia, June 1992.

	Aeschynomene		Alyceclover		Pigeon peas	
Site	Mean	SE	Mean	SE	Mean	SE
Madison County						
July						
Production	1446.3 A[a]	250.4	1086.0 A	68.8	542.7 B	175.6
Utilization	1071.1 A	259.6	367.2 B	174.3	27.2 B	164.7
August						
Production	945.1	285.8	1017.0	154.9	1847.9	430.6
Utilization	778.2	243.5	455.9	176.0	550.8	223.6
September						
Production	1674.4 A	56.7	−30.4 B	112.1	2180.0 A	501.0
Utilization	1727.6	143.2	901.5	1.2	375.3	1294.5
October						
Production	403.9	343.0	−120.3	35.2	518.8	879.0
Utilization	808.2	311.5	160.8	111.6	929.2	549.1
Morgan County						
July						
Production	863.7 A	27.8	1144.1 A	176.2	250.0 B	43.1
Utilization	670.1 A	30.5	717.5 A	158.0	0.5 B	104.3
August						
Production	1444.2	187.0	1800.9	361.1	1464.3	149.9
Utilization	1202.5 B	82.9	1673.3 A	156.5	1484.0 A	15.9
September						
Production	1346.0	108.1	2103.6		907.3	310.8
Utilization	1343.8	111.8	1549.8		935.1	261.0
Putnam County						
July						
Production	284.3	54.0	170.7	46.0	156.4	100.5
Utilization	210.0	57.2	89.6	46.2	62.8	78.9
August						
Production	1754.5 B	57.1	2154.6 A	83.5	300.8 C	115.0
Utilization	1539.6 B	78.6	1964.8 A	60.1	261.1 C	18.5
September						
Production	693.0	228.7	727.9	259.0	285.2	16.6
Utilization	634.4	138.0	635.4	349.4	285.0	125.2
October						
Production	646.9	129.1	413.0	281.2	446.6	106.1
Utilization	703.6	38.9	268.1	289.6	71.2	106.7

[a]Means separated by Duncan's Multiple Range Test; those sharing a letter within a row are not significantly different ($P > 0.10$).

forage production. Ladino clover produced the most forage in May, although not significantly more than small burnet. Small burnet and ladino clover were the best producers during July, and the only producers from September through November. Ladino clover produced more forage than small burnet in June and September in Putnam County. In Madison County, utilization of wheat was higher than any other forage species from January through March. The most utilized legume during this period was cody alfalfa. In May, ladino clover and

Table 2. Mean monthly crude protein (%) of warm season forages established in Madison, Morgan, and Putnam counties, Georgia, June 1992.

	Aeschynomene		Alyceclover		Pigeon peas	
Period	Mean	SE	Mean	SE	Mean	SE
July	22.0	0.9	21.3	2.9	27.4	0.6
August	21.0	1.3	18.7	2.6	23.7	2.6
September	22.0	1.6	15.7	2.2	21.0	1.6
October[a]	19.2	0.8	11.5	0.2	15.4	1.8
Mean	21.2	0.6	17.3	1.4	22.5	1.5

[a]Madison and Putnam counties only.

small burnet were utilized more than any other forage species; however, at this study site, more ladino clover was utilized from July through October.

During February, wheat was utilized more than the other plantings in Morgan County. In March, wheat and small burnet were utilized the greatest. Cody alfalfa was utilized most during July, possibly due to its greater availability at this site.

Similar to the other study sites, more wheat was utilized during January and February in Putnam County. In April and May, ladino clover was utilized more and in June, greater amounts of ladino clover and small burnet were utilized. More ladino clover was utilized in August and October than small burnet during this same period.

Quality of available cool-season plantings remained high throughout the study (Table 6). One exception was small burnet, which averaged 13.7% CP for the entire study. All other species averaged over 19.0% CP. Ladino clover had the highest mean CP at 21.2%; wheat and hubam clover also exceeded 20% CP. Except for wheat and small burnet, no distinct downward trend was seen for the cool-season forages. However, CP values for some species fluctuated during the study.

Discussion and Conclusions

Forage growth at each study site was influenced by several factors. Mean monthly precipitation was slightly above normal during warm-season forage trials, and likely contributed to the high standing crop values and production yields of test forages. An extended period of drought immediately after planting influenced the cool-season trials. Weed competition, primarily johnsongrass (*Sorghum halepense*), coffeeweed (*Cassia obtusifolia*), and camphor weed (*Heterotheca* spp.), was intense at all sites and likely depressed production of some species. Utilization of supplemental forages likely was influenced by growth stage of the test species, and availability and quality of naturally occurring forages.

Table 3. Mean monthly production and utilization by white-tailed deer (kg/ha) of cool season forages established in Madison County, Georgia, in October 1991.

	Cody alfalfa		Hubam clover		Regal ladino clover		Sainfoin		Small burnett		Wheat	
Period	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
January												
Production	269.9 B[a]	18.3	63.1 BC	16.8	0.0 C	0.0	74.2 BC	4.3	263.4 B	89.9	897.0 A	202.4
Utilization	139.3 B	59.7	33.7 B	34.9	0.0 B	0.0	39.7 B	9.8	144.4 B	92.0	654.2 A	160.2
February												
Production	264.3 B	33.1	29.8 C	31.0	18.3 C	8.6	21.1 C	11.2	8.7 C	77.4	675.6 A	103.2
Utilization	124.6 B	84.0	−5.6 BC	32.6	−6.0 BC	13.5	−25.9 C	47.0	84.0 BC	52.5	625.6 A	56.6
March												
Production	384.5 B	220.3	46.3 B	32.0	233.7 B	78.6	19.2 B	32.7	403.9 B	164.6	2632.4 A	262.6
Utilization	356.2 B	155.3	19.1 B	59.8	217.1 B	59.4	20.2 B	19.7	265.3 B	129.1	1382.6 A	399.2
April												
Production	131.1 B	36.0	21.2 B	11.2	431.1 B	121.8	94.7 B	12.3	500.8 B	91.5	2368.4 A	528.5
Utilization	85.8	87.6	28.9	54.0	207.0	143.4	76.0	9.3	295.6	43.4	−348.5	482.5
May												
Production	−94.7 B	211.2	176.7 B	110.8	1883.2 A	355.5	58.7 B	38.4	1808.2 A	268.6		
Utilization	90.9 B	178.4	63.3 B	54.8	1398.5 B	221.0	101.0 B	2.0	1010.2 A	517.4		

June										
Production	466.8 B	413.0	603.8 B	387.6	2091.8 A	343.6	62.3 B	87.8	2273.9 A	1008.7
Utilization	136.6	88.7	618.7	318.4	1686.4	388.4	101.9	114.6	1096.6	874.2
July										
Production	−411.7	511.2	658.9	771.9	2465.2	282.6	−3.6	48.1	−561.6	1161.6
Utilization	186.1 B	63.5	55.4 B	1.8	2551.1 A	145.0	0.3 B	0.3	546.6 B	1000.4
August										
Production	366.3	67.4			1358.7	382.7			401.5	509.1
Utilization	−95.1 B	136.8			1163.4 A	310.9			654.8 B	114.9
September										
Production	−292.8 B	193.4			149.9 AB	258.7			461.6 A	74.8
Utilization	−71.0 B	143.6			1211.7 A	293.2			385.4 B	285.5
October										
Production					1940.6 A	200.8			−153.2 B	337.2
Utilization					2076.9 A	158.0			839.2 B	263.8
November										
Production					491.3	129.2			427.9	249.5
Utilization					395.0	108.0			489.6	253.0
December										
Production					504.0	116.5			174.0	143.6
Utilization					220.4	226.2			151.2	131.1

[a]Means separated by Duncan's Multiple Range Test; those sharing a letter within a row are not significantly different ($P > 0.10$).

Table 4. Mean monthly production and utilization by white-tailed deer (kg/ha) of cool season forages established in Morgan County, Georgia, in October 1991.

	Cody alfalfa		*Hubam clover*		*Regal ladino clover*		*Sainfoin*		*Small burnett*		*Wheat*	
Period	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
January												
Production	55.2 B	1.2	4.8 B	1.7	0.0 B	0.0	6.9 B	2.7	2.5 B	1.4	310.5 A	110.1
Utilization	−1.6	24.4	2.1	0.9	0.0	0.0	−2.9	5.3	−1.3	0.6	70.1	75.7
February												
Production	247.9 B	18.0	33.0 B	4.5	49.5 B	48.1	10.3 B	10.2	21.1 B	10.5	714.1 A	202.4
Utilization	29.8 B	83.1	16.9 B	9.5	48.5 B	47.1	−27.9 B	24.1	8.7 B	10.5	531.5 A	247.8
March												
Production	47.8 B	151.2	23.0 B	10.4	41.4 B	41.4	0.0 B	20.9	587.9 B		2049.8 A	488.0
Utilization	223.7 BC	73.5	20.1 C	24.5	37.0 C	37.0	4.7 C	10.2	575.5 AB		952.9 A	364.7
April												
Production	160.5 B	30.8	25.8 B	0.6					132.2 B	158.2	3071.3 A	515.3
Utilization	100.7	69.3	10.6	15.0					138.7	126.6	−34.9	387.9
May												
Production	444.4	240.6	99.4	84.7					307.5	147.2		
Utilization	333.4	182.6	67.3	41.5			72.2	59.1	−121.5	117.5		

June								
Production	139.9	113.2	106.5	36.9	77.7	74.5	−176.7	333.1
Utilization	227.4	222.7	98.3	39.7	57.1	64.1	90.9	87.2
July								
Production	1321.1 A	336.6	142.1 B	100.4	60.5 B	102.4	375.5 B	192.7
Utilization	1073.0 A	471.8	141.1 B	100.1	70.9 B	70.9	455.0 B	242.5
August								
Production	190.7	256.0					298.5	174.9
Utilization	359.2	305.8					−527.1	16.9
September								
Production							−362.1	251.2
Utilization							311.1	147.2
October								
Production							372.7	90.0
Utilization							265.5	144.3
November								
Production							143.6	93.9
Utilization							261.5	95.6
December								
Production							274.4	13.0
Utilization							127.8	50.5

[a]Means separated by Duncan's Multiple Range Test; those sharing a letter within a row are not significantly different ($P > 0.10$).

Table 5. Mean monthly production and utilization by white-tailed deer (kg/ha) of cool season forages established in Putnam County, Georgia, in October 1991.

Period	Cody alfalfa		Hubam clover		Regal ladino clover		Sainfoin		Small burnett		Wheat	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
January												
Production	108.7 B	36.2	37.7 B	3.8	3.6 B	1.4	19.4 B	3.1	8.0 B	4.2	254.7 A	87.4
Utilization	2.8 B	18.9	4.2 B	9.4	−1.4 B	2.0	7.4 B	5.7	−22.3 B	6.6	229.4 A	82.3
February												
Production	126.1 B	44.4	58.5 B	14.7	62.0 B	18.5	26.0 B	12.9	130.9 B	23.1	423.7 A	121.8
Utilization	−22.7 C	72.3	40.7 BC	28.5	27.1 BC	26.1	12.1 BC	8.1	112.9 B	40.3	293.3 A	69.4
March												
Production	−104.3 B	85.2	64.3 B	30.7	293.2 B	77.0	47.2 B	69.1	315.9 B	87.4	943.4 A	380.8
Utilization	30.8	84.8	43.0	9.7	195.5	29.7	40.3	64.3	113.7	92.1	376.9	211.9
April												
Production	106.3 B	138.3	27.5 B	54.5	1282.2 A	368.9	90.1 B	87.9	481.6 AB	295.1	1102.4 A	701.7
Utilization	10.1 B	134.0	52.3 B	34.3	943.3 A	251.4	12.4 B	69.0	−24.9 B	8.7	245.9 B	338.7
May												
Production	236.0 BC	195.4	75.3 C	19.0	1485.7 A	498.7	−29.4 C	37.2	842.2 AB	330.4		
Utilization	306.4 B	196.2	72.8 B	27.6	1598.1 A	457.8	34.4 B	23.9	116.2 B	107.6		
June												
Production	455.1 B	82.7	203.6 B	40.2	1125.8 A	140.6	35.5 B	30.1	101.2 B	361.7		
Utilization	351.0 BC	176.0	56.4 C	9.3	1042.7 A	228.3	27.6 C	26.6	699.8 AB	148.8		
July												
Production	121.1 B	255.0	−67.1 B	108.5	988.7 A	220.3			760.3 A	208.6		
Utilization	242.3	150.8	49.0	125.2	731.1	325.7			−45.8	88.7		
August												
Production	−89.7	57.0			196.2	246.8			−261.3	563.6		
Utilization	−24.4 B	22.3			749.7 A	165.6			213.5 B	221.9		
September												
Production					67.6 A	25.6			−1165.2 B	409.5		
Utilization					143.5	66.4			−33.7	57.7		
October												
Production					212.6	143.3			98.7	80.8		
Utilization					171.4 A	150.5			−181.9 B	67.8		
November												
Production					174.0	134.7			306.7	119.2		
Utilization					182.4	104.2			396.9	181.2		

[a]Mean separated by Duncan's Multiple Range Test; those sharing a letter within a row are not significantly different ($P > 0.10$).

Table 6. Mean monthly crude protein (%) of cool season forages established in Madison, Morgan, and Putnam counties, Georgia, in October 1991.

	Cody alfalfa		Hubam clover		Regal ladino clover		Sainfoin		Small burnett		Wheat	
Period	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Jan	18.7	3.8	19.7	4.4			21.6	5.8	14.1		23.6	5.7
Feb	18.9	2.3	24.2	0.3	23.4	6.8	25.8	3.4	22.3	2.2	27.1	1.3
Mar	18.0	2.2	22.5	1.3	24.4	0.9	20.1	1.9	20.2	1.9	16.8	2.6
Apr	21.1	0.9	22.6	2.2	24.9	0.0	19.0	0.7	17.8	2.8	15.4	4.0
May	21.2	1.7	21.0	1.8	21.0	0.8	17.4	2.2	10.7	0.1		
Jun	21.5	1.9	19.1	1.3	20.6	0.5	18.3	1.9	12.8	0.7		
Jul	17.1	4.2	13.6	0.7	22.3	0.3	19.8	0.6	13.0	2.9		
Aug	16.8	0.8			18.3				11.0	0.6		
Sep	18.4				19.0	1.1			12.8	2.1		
Oct					16.3	2.8			12.3	1.8		
Nov					18.0	4.5			11.5	2.1		
Dec					22.0	2.7			9.2	1.5		
Mean	19.2	0.8	20.4	0.9	21.2	1.1	20.0	1.0	13.7	0.8	20.7	2.2

Aeschynomene had high production and utilization values at all study sites. Aeschynomene has been widely tested in Louisiana, Mississippi, and Texas. Lunceford (1986) reported yields of 236 and 280 kg/ha for August and July, respectively, in the Gulf Coastal Plain of Mississippi. In another Mississippi study, Davis (1988) obtained total production yields of 491 kg/ha. Keegan and Johnson (1987) reported much greater yields (5,690 kg/ha) in Louisiana, and Higginbotham (1991) reported yields exceeding 8,300 kg/ha inside an exclosure on a pineywoods bottomland site in eastern Texas. Yields of aeschynomene in our study were high despite having the greatest mean utilization rates, indicating a high tolerance to browsing pressure.

Aeschynomene and alyceclover are adapted to well drained, sandy soils, and are susceptible to weed competition during seedling stages (Ball et al. 1991). Weed competition was intense at all study sites. Control of invading weeds likely would have increased forage yields of test species. Availability of aeschynomene and alyceclover was highest during August and September, a period when quality of naturally occurring forages is low. High productivity, acceptance by deer, and availability during a nutritionally stressful period suggests that these species are good choices for warm-season supplemental plantings in Georgia.

Highest utilization rates for pigeon peas occurred in August and September in Morgan County. Deer primarily consumed seed pods of pigeon peas during late stages of growth. Better results for these species likely would be seen when planted in larger areas, or in combination with other species to reduce utilization during establishment.

Crude protein was considered an indication of forage quality in this study. Because only single samples were analyzed, no statistical analyses were made. Protein levels were high for all warm-season species tested, an important characteristic when choosing a forage to supplement protein intake during late summer. Both pigeon peas and aeschynomene had mean CP levels exceeding 20%. Higginbotham (1991) reported CP values similar to those found for aeschynomene and somewhat lower levels for alyceclover. All species averaged more than 17% mean monthly CP.

In the cool-season trials, flat peas and milkvetch may have germinated and then quickly died from lack of precipitation during October and November 1991. The remaining species were not eliminated, although this dry period may have decreased stand vigor and productivity at all sites. Wheat was the most productive cool-season forage at all sites between January and April. All cool-season plots were planted in October, and wheat was well established when sampling began in January. Early establishment of wheat makes it a good choice to use combined with a slower establishing species. Wheat was eliminated from sampling in May after plants reached maturity and growth ceased. Productivity of small burnet increased from January through May. During this same period in Madison County, productivity of ladino clover increased through July, then decreased through the remainder of the study. In Putnam County, ladino clover increased in productivity through May and then generally decreased during sub-

sequent sampling periods. Sainfoin, hubam clover, and cody alfalfa had low productivity and none persisted past September. Higginbotham (1991) reported similar results for hubam clover and alfalfa. These species generally require intense maintenance and did not compete well with invading weeds.

Due to high variability, few differences in utilization rates occurred during this study. However, visual observations suggested that at the beginning of the study, wheat was used considerably more than other species, primarily due to greater availability. Utilization of most species generally decreased in spring once naturally occurring browse began growing. Utilization of species remaining after May generally declined until late summer. An increase in forage production after a decrease in utilization was not observed in this study. Decreases in forage utilization generally coincided with decreases in availability.

Small burnet had the lowest mean crude protein content of any forage tested during this study, and may have been selected against. All other forages maintained relatively high CP levels throughout the study. During the late winter stress period, CP values were high for all species. In October and November, CP values of ladino clover were lowest of any sampling period. However, even these lowest levels provide sufficient amounts of protein to deer (Murphy and Coates 1966). Higginbotham (1991) found similar CP values for wheat, alfalfa, and hubam clover; however, much lower CP levels for ladino clover during June and July were reported.

Species longevity is an important consideration when establishing supplemental plantings. Only 2 cool-season species, ladino clover and small burnet, persisted throughout the study. Flat peas and milkvetch failed to produce a stand at any study site. Of the remaining species, wheat and hubam clover were cool-season annuals and dropped out of production in April and July, respectively. Cody alfalfa and sainfoin were poor choices in this study because they did not compete well with invading weeds during establishment. An aggressive weed control program likely would increase stand productivity and extend the longevity of cody alfalfa and sainfoin. Our study indicates that if weed control is not an option, these species may not be successful. At 2 locations, ladino clover produced the most consistent amounts of forage and was generally the most highly utilized of the cool-season plantings. Stands of small burnet persisted throughout the study; however, low utilization rates and low CP levels indicate that it may be a poor choice in the Georgia Piedmont.

Any single forage may be enhanced when combined with a complementary planting. Although not addressed in this study, others have suggested that combinations of cereal grains and slower establishing cool-season legumes may increase productivity, availability, and longevity of some plantings (Davis 1988). The same may be true for warm-season combinations such as alyceclover/grain sorghum. Additionally, land managers should provide an adequate dispersion of both cool-season and warm-season plantings to provide supplemental forage during critical periods of the year.

Although no supplemental planting can provide large amounts of highly

nutritious forage during all seasons, certain plantings can increase amount of nutritious forage available to wildlife. Agricultural plantings should supplement natural forages, not replace them. Providing adequate nutrition to a deer herd requires proper habitat management and appropriate population management. Further research is needed to address advantages and disadvantages of establishing combinations of forage species and to evaluate effects of regular food plot maintenance such as mowing or annual fertilization on the productivity, utilization, and longevity of supplemental forages.

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