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Performance of Warm-Season Legume Cover Crops in Florida

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ABSTRACT

From 2015-2018, the United States Department of Agriculture, Natural Resources Conservation Service (USDA- NRCS), Brooksville Plant Materials Center (PMC) in Brooksville, Florida, gathered data on plant characteristics and yield for sixteen species and cultivars of warm-season legumes that have potential for use as summer cover crops in central Florida. Plots were planted in June in all study years. Common and ‘Tropic Sun’ sunn hemp (*Crotalaria juncea* L.) were the highest yielding legumes in the study. ‘AU Golden’ flowered earlier than those two other sunn hemp sources and, because plants in this study were harvested in the flowering stage, produced slightly less biomass. The related common red “mini” hemp (*Crotalaria ochroleuca* G. Don) was also highly productive, but seed of this species is difficult to find. ‘Iron & Clay’ cowpea [*Vigna unguiculata* (L.) Walp.] was a high yielding vining legume; it flowered earlier than ‘Red Ripper’ or ‘Chinese Red’ cowpeas. Early canopy closure of all three cowpea cultivars was good. ‘Rongai’ lablab [*Lablab purpureus* (L.) Sweet] was another vining legume that provided good ground coverage and high biomass production. Plants in the lablab plots were harvested in the vegetative stage because they had not flowered when the evaluation period ended in September. Common alyceclover [*Alysicarpus ovalifolius* (Schumach.) J. Leonard], ‘Georgia Two’ pigeonpea [*Cajanus cajan* (L.) Millsp.], and common sesbania [*Sesbania herbacea* (Mill.) McVaugh.] were moderate biomass producers in this study. Alyceclover plants provided good canopy cover but stands of the other two species were less dense. ‘Laredo’ and ‘Large Lad’ forage soybeans [*Glycine max* (L.) Merr.] produced less biomass than most of the other legumes studied; the modest growth of these soybeans indicated that they were poorly adapted as cover crops at this location. Lark Selection partridge pea [*Chamaecrista fasciculata* (Michx.) Greene] (hereafter referred to as Lark) did not establish sufficient stands in the plots in any of the years that it was planted (2015-2017) for biomass to be harvested. ‘Comanche’ partridge pea establishment was more successful; however, canopy coverage was very poor (20% or less) and biomass production was poor to moderate. Stands and biomass production of common velvet bean [*Mucuna pruriens* (L.) DC. var. *utilis* (Wall. ex Wight) Baker ex Burck] were poor to moderate; however, this may have been due to the low seeding rate that was used.

INTRODUCTION

Incorporating cover crops into cropping systems can improve soil quality and resiliency of agricultural lands by increasing soil organic matter, improving water holding capacity, providing and sequestering nitrogen, reducing soil erosion, and suppressing weeds and other pests. Cover crops are useful in both conventional row crops and organic cropping systems (SARE, 2007; Wright et al., 2017). Selecting the most useful warm-season legume species or cultivars to fit

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into specific cropping systems has been constrained by a lack of data on growth potential, biomass production, adaptability, winter hardiness, and bloom time of these species or cultivars. In the southeastern US, data on potential cover crops are arguably even more lacking than in other parts of the US. As a result, many producers in the Southeast, except for those growing organic crops, have not begun to embrace the idea of incorporating cover crops into their production systems.

Currently, most of the available information on potential warm-season legumes for use as cover crops in this region has been culled from research on using these species as forage, as grain, or vegetable crops, all of these uses have different management requirements than when using them as cover crops. The Florida Department of Agriculture and Consumer Services (FDACS) reports that almost a fifth of the receipts from Florida agricultural production in 2017 was derived from production of vegetable crops and almost the same amount was derived from production of citrus and other fruits and nuts (FDACS, no date). These crops often require a broader spectrum of cover crop options than those traditionally used in agronomic row crop systems. For example, in Florida there may be a greater need for summer cover crops, because a large portion of vegetable production occurs during the winter months. Also, because of our mild weather, tropical species not suitable for use in cooler climates, may be well adapted for use as cover crops here. Even row crop producers may have needs for cover crops at different times of the year than producers in more temperate areas if they wish to keep a year-round cover on the soil.

Objective of this study was to assemble a wide range of commercially available sources of warm-season legumes with potential for use as cover crops in Florida and to collect information on survival, phenology, and productivity from evaluations at the USDA-NRCS, Brooksville PMC.

MATERIALS AND METHODS

Seed lots of warm-season legume cultivars shown in Table 1 were purchased from commercial producers in the spring of 2015, except for Comanche partridge pea, which was obtained from the James E. "Bud" Smith PMC in Knox City, TX, and Tropic Sun sunn hemp seed obtained from the Hawaii PMC in Ho'olehua. These same seed lots were used for planting during 2015, 2016, and 2017 with the following exceptions. A seed tag was not provided for the Lark partridge pea purchased in 2015 and the lot contained a high percentage of weed seeds. New Lark seed was provided by the Jamie L. Whitten PMC in Coffeeville, Mississippi for the 2016 and 2017 plantings; it was not included in the 2018 planting. Velvet bean seeds that were purchased in 2015 also did not come with a seed tag and germination was poor, so new seed was purchased in 2016 for the 2016 and 2017 plantings; it was dropped from the 2018 planting. Common alyceclover, Comanche and Lark Selection partridge pea, Georgia Two pigeon pea, common red "mini" hemp, and common sesbania were also excluded from the 2018 planting. There were concerns that the quality of the seed of the other cultivars was deteriorating in storage, so new seed of the commercial-sourced seed types was purchased in the spring of 2018. AU Golden sunn hemp was not intentionally excluded from the 2018 planting, but a seed source could not be found. The same cultivars of the other species were purchased, but it was not always possible to purchase each cultivar from the same vendor that was used in 2015.

The planting area was clean tilled and cultipacked prior to and after planting. All plots were planted on a single planting date. Planting dates were 11 June 2015, 23 June 2016, 21 June 2017,

and 26 June 2018. Seeding rates (Table 1) were based on university extension recommendations for the southeastern US, such as those presented in Wright et al., 2017 for Florida cover crops. If seeding rates for a species were not available from extension publications, then rates were based on references from other reputable sources. Seeds were inoculated with the correct strain of rhizobacteria prior to planting.

In 2015 and 2016, plots (4 ft x 20 ft) were planted by broadcasting the seed uniformly over the entire plot and the soil was lightly raked to incorporate the seed. In 2017 and 2018, the plots were planted using a precision plot seeder (Wintersteiger Plotseed XL, Wintersteiger, Inc, Salt Lake City, UT), which seeded 8 rows spaced 6 in apart. This equated to a 3.5 ft wide planting area and the plot length remained 20 ft. The quantity of seed was adjusted in these years to plant at the same seeding rate used in 2015 and 2016. The study was arranged as a randomized complete block with 3 (2015-2017) or 4 replicates (2018).

Table 1. Species, cultivars, and seeding rates of warm-season grasses used in evaluation plots at the Brooksville Plant Materials Center 2015-2018.

Common Name	Scientific Name	Cultivar/Selection	Seeding Rate ¹ -----lb/ac-----
Alyceclover	<i>Alysicarpus ovalifolius</i>	Common ^{2,3}	13
Cowpea	<i>Vigna unguiculata</i>	Chinese Red	70
		Iron & Clay	70
		Red Ripper	70
		Laredo	20
Forage Soybean	<i>Glycine max</i>	Large Lad	50
		Rongai	95
Partridge Pea	<i>Chamaecrista fasciculata</i>	Comanche ³	10
		Lark ³	10
Pigeonpea	<i>Cajanus cajan</i>	Georgia Two ³	20
Red “Mini” Hemp	<i>Crotalaria ochroleuca</i>	Common	5
Sesbania	<i>Sesbania herbacea</i>	Common	18
Sunn Hemp	<i>Crotalaria juncea</i>	AU Golden	20
		Common	20
		Tropic Sun	20
Velvet Bean ³	<i>Mucuna pruriens</i> var. <i>utilis</i>	Common	35 (2015), 46

¹ Seeding rate is in bulk pounds per acre.

² Common seed lots sold without a cultivar name; can also be referred to as variety not stated (VNS) seed.

³ Not planted in 2018.

Plots were moved to different fields at the PMC each year to prevent potential issues with carryover of dormant seeds. Soil type in 2015 was a Nobleton fine sand - 0-5% slopes (Forage Suitability Group [FSG] G154XB231FL). In the following year, plots in the first replication were located on a Nobleton soil, with plots in the second and third replication on a Kendrick fine sand - 0-5% slopes (FSG G154XB211). In 2017 the plots were planted on a Nobleton soil that graded into a Kendrick soil in the third replication. In 2018, the plots were planted on an Electra variant fine sand - 0-5% slopes (FSG G154XB131FL).

Soil samples taken from the planting areas in each year were submitted to the University of Florida Extension Soils Laboratory to determine fertilizer needs. Prior to planting, P₂O₅ and K₂O fertilizer was applied to the entire planting area as needed based on the reports received from the laboratory. No nitrogen fertilizer was applied. Plots were irrigated as needed to maintain adequate plant growth in 2015-2017 but not in 2018. Plant growth in each plot was terminated by mowing following harvest (see data collection below).

Data Collection:

- a. Emergence (see Appendix tables) – Emergence was rated at 7, 14, and 21 days after planting (DAP) in 2015 and 2017 and 7 and 14 DAP in 2016 and 2018 on a rating scale of 0-3 where 0 = Poor (<25%); 1 = Moderate (30-60%); 2 = Good (65-85%); 3 = Excellent (90-100%). Emergence of Lark partridge pea and common velvet bean were so poor in 2015 that the plots were terminated after these ratings were completed.
- b. Vigor (see Appendix tables) – Vigor of the plants was rated visually in 2015 and 2016. The vigor rating scale ranged from 1-5 where 1 = Poor; 2 = Fair; 3 = Good, 4 = Very Good, and 5 = Excellent.
- c. Canopy (Table 2 and see Appendix tables)– A visual estimate of the amount of canopy cover was rated at various intervals during the evaluation period. From 2015-2017, the rating scale used was 0-10 where 0 = less than 10%; 1 = 10%; 2 = 20% 3 = 30%; 4 = 40%, 5 = 50%; 6 = 60%; 7 = 70%; 8 = 80%; 9 = 90%; and 10 = 100% cover. In 2018, the scale used was 1-5 where 1 = 0-15%; 2 = 20-35%; 3 = 40-60%; 4 = 65-80%; 5 = 85-100%.
- d. Plant height (see Appendix tables)– Plants were measured at various intervals during the evaluation period and at harvest. Three randomly selected plants were measured from the ground to the uppermost leaf (not to the top of the inflorescence) or for vining legumes, three measurements were taken from the ground to the top of the plant mass at three random locations within the plot.
- e. Insect and disease ratings (see Appendix tables) – Damage from insects and diseases was either noted or visually rated during the evaluation period. The rating scale used was 0-5 where 0 = No Damage and 5 = Severe Damage.
- f. Flowering (see Appendix tables) – Flowering stage was recorded at regular intervals during the 2016 evaluation periods. In 2017, flowering was rated as a percentage of the plants in the plot that were in flower at 10-day intervals starting at 40 DAP. In 2018, plots were checked every three days for flower development and the date when plants reached the boot or head emergence stage was noted for each plot.
- g. Dry matter yield (Tables 3 and see Appendix tables) – Aboveground biomass was harvested after the plants reached the flowering to seed set stage. Plant matter from a 5.4 ft² (0.5 m²) area in the center of each plot was cut at ground level and weighed. A uniform grab sample was pulled from the harvested material, cut into smaller sections, and dried to determine moisture content in the plant tissue. The moisture content was used to calculate dry matter (DM) yield for each plot.
- h. C:N ratio (Table 4 and see Appendix tables)– The grab samples of the dried plant material were fed through a hammermill to roughly grind the tissue, and a sub-sample (2-4 oz) was collected for tissue testing. The samples were sent to the Agricultural and Environmental Services Laboratories at the University of Georgia for analysis of total carbon (C) and total nitrogen (N). These values were used to calculate the C:N ratio of the plant tissue.

DM yields were subjected to an analysis of variance procedure and significant means were separated at $P < 0.05$ using the least significant difference all pairwise comparisons test in Statistix 10 (Analytical Software, Tallahassee, FL). Species and cultivars with similar growth habit were grouped for comparison; this led to three groups, BUSHY with branches close to ground (alyceclover, partridge pea, forage soybean, and pigeon pea), UPRIGHT with erect growth habit and few branches (sesbania and sunn hemp) and VINING (cowpea, lablab, velvet bean). Data sets that were not normally distributed were transformed prior to analysis. The raw data sets for the entire study period (Tables 5-26) are included in Appendix A.

RESULTS AND DISCUSSION

Canopy Cover

Rapid germination and canopy cover are important for a cover crop selection, particularly if weed pest pressure (Brennan and Smith, 2005; Akemo, Regnier, and Bennet, 2000) or soil erosion as estimated with RUSLE2 (USDA, ARS 2013) is a resource concern. Legumes in the VINING group had the highest cover rating (>60%, Table 2) 28-30 DAP, although these high ratings were probably somewhat biased by their vining nature. All species in the UPRIGHT group and alyceclover in the BUSHY group consistently averaged between 40-60% at 28-30 DAP. Coverage of the forage soybeans from the BUSHY group averaged between 40-60% but was more variable than the other species in that group across years, ranging between 30-60% at

Table 2. Average of canopy cover ratings for all warm-season legume plots planted at the Brooksville Plant Materials Center at 28-30 days after planting (DAP).

Species	Cultivar/Selection	2015 ¹ 28 DAP	2016 28 DAP	2017 30 DAP	2018 30 DAP
BUSHY					
Alyceclover	Common	3	4	3	- ²
Forage Soybean	Laredo	3	3	2	2
Forage Soybean	Large Lad	3	3	3	1
Partridge Pea	Comanche	2	1	1	-
Partridge Pea	Lark	§ ³	§	§	-
Pigeonpea	Georgia Two	2	2	3	-
Red “Mini” Hemp	Common	2	2	2	-
UPRIGHT					
Sesbania	Common	3	3	3	-
Sunn Hemp	AU Golden	3	3	4	-
Sunn Hemp	Common	3	3	3	3
Sunn Hemp	Tropic Sun	3	3	3	3
VINING					
Cowpea	Chinese Red	4	5	4	4
Cowpea	Iron & Clay	4	5	3	4
Cowpea	Red Ripper	4	5	3	4
Lablab	Rongai	3	4	3	5
Velvet Bean	Common	3	2	4	-

¹ Canopy rating scale 1-5 where 1 = 0-15%; 2 = 20-35%; 3 = 40-60%; 4 = 65-80%; 5 = 85-100% canopy cover. The 0-10 rating scale used in 2015-2017 was converted to 1-5 shown.

² Not planted in 2018.

³ No germination.

28-30 DAP. The red “mini” hemp, pigeon pea, and the two partridge pea accessions were rated with <40% canopy coverage at 28-30 DAP.

Low 28-30 DAP coverage of red “mini” hemp may be related to hard seededness (Tauro et al., 2009), but this was not reflected in DM at termination (see Table 3). Poor coverage of the pigeonpea was not unexpected as has been reported to be slow to establish and susceptible to weed competition during the establishment period (Sheahan, 2012). The partridge peas had particularly low canopy coverage ratings due in part to essentially no seed germination for Lark regardless of seed lot, and low germination for Comanche which had only 20% canopy cover 28-30 DAP. Partridge pea seed is known to have a hard seed coat and poor germination of the partridge pea cultivars could be the cause of slow canopy cover. Scarification helps but is not deemed essential for wildlife plantings, critical area plantings, etc. (Houck and Row, 2006). Essentially no Lark seedlings were seen regardless of seed lot used, so poor seed quality, not simply hard-seededness was probably the issue with that selection. Regardless of unscarified germination rate, Rich et. al. (2003) recommend that only scarified seed should be used when partridge pea is planted as a cover crop. This illustrates the difference in recommendations necessary for cover crop vs. other uses.

Canopy coverage at one month after planting for the three cowpea cultivars was the highest of all legumes tested in 2015 and 2016 (Table 2). In 2017, plots of the three cultivars were rated as having 100% canopy coverage at 40 DAP (see Appendix Table 19). The quick canopy closure of cowpeas allows these plants to effectively smother weeds (Creamer and Baldwin, 2000; SARE, 2007). Iron and Clay is also resistant to root-knot nematodes (SARE, 2007) and is the cultivar that is typically planted in Florida (Wang, et al., 2006). From 2015-2017, one-month canopy ratings for Rongai lablab ranged from 60 to 80%, with 85-100% coverage recorded in 2018 (Table 2).

Brennan and Smith (2005) found that early season canopy development had a significant effect on subsequent weed suppression and ground cover at 28-36 DAP and were highly correlated ($r \geq 0.92$) with cover crop density. Of the species tested, the species in the VINING and UPRIGHT groups appear to meet the need for early canopy coverage. Alyceclover also meets that requirement, but unfortunately seed availability is limited at this time (J. Grabowski, personal observation). Further studies to evaluate scarification and/or increasing seeding rate are warranted for pigeon pea, partridge pea, forage soybeans, and the red “mini” hemp to improve early ground cover. An additional consideration is that they may be only suited for mixtures, particularly with grasses, when used in cover cropping situations.

Dry Matter

Dry matter yield is shown in Table 3. Consistently across groups, yields in 2016 were lower and there were no differences. The field where the plots were located had a long-term cool season cover crop study that ended a few months earlier. Although standard soil tests were done to determine macronutrient needs and applied these as recommended, we suspect that there may have been micronutrient deficiencies that were not captured with this testing. Or there may have been other carryover effects from the long-term study that affected plant growth in this field. For this reason, DM yield discussions are limited to 2015, 2017, and where appropriate, 2018.

In spite of the relatively marginal canopy cover rating at 28-30 DAP (Table 2), the common red “mini” hemp was the highest yielding among the BUSHY legumes. It produced 2 to 2.5 times as much DM as any of the other BUSHY group, although this was not significantly higher than that of Georgia Two pigeonpea or common alyceclover in 2017. Red “mini” hemp is used as a cover

Table 3. Dry matter yields of bushy legumes planted during four years at the Brooksville Plant Materials Center.

Species	Cultivar	2015	2016	2017	2018
BUSHY		lb/acre			
Alyceclover	Common	7,312 b ¹	1,293	2,665 ab	- ²
Forage Soybean	Laredo	3,933 b	1,218	695 c	643
Forage Soybean	Large Lad	3,895 b	1,132	699 c	NP
Partridge Pea	Comanche	4,809 b	1,371	2,673 bc	-
Partridge Pea	Lark	§ ³	§	§	-
Pigeonpea	Georgia Two	5,309 b	1,177	3,759 ab	-
Red “Mini” Hemp	Common	19,282 a	1,298	8,628 a	-
	BUSHY Group Mean	7,407	1,248	3,187	
UPRIGHT					
Sesbania	Common	2,244 b	1,165	978 b	-
Sunn Hemp	AU Golden	10,508 ab	2,565	12,290 ab	-
Sunn Hemp	Common	17,234 ab	5,294	21,757 a	20,746
Sunn Hemp	Tropic Sun	31,322 a	4,142	21,096 a	18,853
	UPRIGHT Group Mean	15,327	3,292	14,030	19,799
VINING					
Cowpea	Chinese Red	3,731 c	1,752	5,171 b	5,814
Cowpea	Iron & Clay	7,846 ab	4,267	8,405 a	14,395
Cowpea	Red Ripper	4,651 bc	1,965	5,346 b	7,920
Lablab	Rongai	10,577 a	2,008	6,368 ab	8,381
Velvet Bean	Common	§	2,730	4,431 b	-
	VINING Group Mean	6,701	2,544	5,944	9,127

¹ Means in columns within a group and year followed by the same letters are not significantly different at $P < 0.05$.

² Not planted in 2018.

³ No harvestable yield.

crop in parts of South America where it is notable for its high biomass production and ability to compete with weeds (Sousa et al., 2016). The species’ prolific branching at the base of the stems probably accounts for the high DM production and weed suppression at low stand densities (Tauro et. al., 2009). Like its relative sunn hemp (*C. juncea*), it has been reported to have some ability to reduce populations of root-knot nematodes (Krueger and McCorley, 2008, Fern, no date).

Alyceclover is typically used in Florida as a summer forage or hay crop but can also be used as a cover crop due to its high biomass production potential (Rich et al., 2003). Common alyceclover was productive at the PMC, but it is highly susceptible to root-knot and sting nematodes and should not be used as a cover crop in areas known to have nematode problems (Rich et al., 2003).

There was no harvestable stand of Lark partridge pea any year regardless of the seed lot used (Table 3). Yields of Comanche partridge pea, in spite of low ground cover rating (Table 2), were generally similar to Georgia Two pigeonpea and common alyceclover both years.

The forage soybeans in 2015 yielded similar to all other legumes of the BUSHY group except red “mini” hemp but produced <700 lb in 2017 which was lower than most of the selections. Seed quality declines in storage were suspected to be the cause of the declining DM production, but yields were even lower in 2018 with “new” seed. Lower Canopy Cover in 2018 suggests the “new” seed might not have been that high a quality. This indicates that producers need to pay attention to the seed lots when purchasing forage soybean for a cover crop planting.

As expected, DM yields of the UPRIGHT group were generally higher than those of the BUSHY or VINING groups (Table 3). *Sesbania* DM was consistently the lowest of the UPRIGHT group; often numerically lower than most selections in the BUSHY and VINING groups. *Sesbania* is a native legume with tall, tapering stems producing few branches (Sheahan, 2013). It has been reported to have slow canopy closure and poor competitive ability with perennial weeds (Wang et al., 2006). One-month canopy ratings for common *Sesbania* in this study averaged 60% for all years that it was planted (Table 2). Because canopy ratings remained constant until the plants were harvested (see Appendix Table 17), the reason for the low biomass production in 2017 is unknown. This species can produce 2 to 3 tons of biomass per acre (Sheahan, 2013), but DM yields in this study were considerably less. *Sesbania* is typically found growing on wetter sites, such as in ditches (Sheahan, 2013). Perhaps the plants did not reach their maximum yield potential at the Brooksville PMC because they were planted on drier, infertile soils. Two caveats to using this species as a cover crop are plants are susceptible to root-knot nematodes and can become weedy if plants are allowed to produce seed (Creamer and Baldwin, 2003; Sheahan, 2013).

Although there were numerical differences with AU Golden having the lowest DM each year, statistically DM yield of the three sunn hemp selections did not differ. Sunn hemp is a tropical legume that is easily killed by freezing temperatures (SARE, 2007). Tropic Sun was tested and released by the Hawaii PMC and the University of Hawaii. Plants of Tropic Sun require short days to flower. Because of its day length requirement and lack of frost-tolerance, Tropic Sun plants cannot consistently set seed north of 28 degrees latitude and seed production in the continental US is severely limited (USDA-NRCS SQI and NPDC, 2005). Auburn University bred AU Golden to allow seed to be produced in more temperate areas of the US (Mosjidic et al., 2013). In this study, AU Golden plants flowered several weeks earlier than the other sunn hemp cultivars (see Appendix Table 18) and were harvested 20-22 days prior to the other selections (see Appendix Table 19). The AU Golden plants were smaller at harvest, which resulted in less biomass. The common sunn hemp seed was of an unknown genotype with distinct morphological differences from Tropic Sun; its leaves were larger and stems stouter (J. Grabowski, personal observation). Producers would typically terminate these sunn hems earlier than bloom stage because the plants become too tall and stems too woody when allowed to grow that long (see Appendix Tables 7, 13, 19, and 25). Red “mini” hemp is a closely related species, but the plants are shorter at harvest than the common and Tropic Sun cultivars (see Appendix Tables 7, 13, and 19). Sunn hemp has allelopathic activity which can contribute to its ability to control weeds but can also affect germination of certain vegetable seeds (Ferguson et al., 2003). Tropic Sun is reported to be resistant to root-knot nematodes, which in addition to its high

biomass production, is a major benefit to using it as a cover crop (Rich et al., 2003; USDA-NRCS SQI and NPDC, 2005; Wang et al., 2006).

‘Iron & Clay’ cowpea and ‘Rongai’ lablab were the highest yielding of the VINING group (Table 3) and essentially equivalent to each other, but the DM yield of these two selections were not always significantly higher than the other cowpeas. Mean dry matter yield of ‘Chinese Red’ cowpea was consistently lower than of Iron & Clay cowpea in all years and ‘Red Ripper’ was intermediate between the two (Table 3). Chinese Red was the earliest cowpea cultivar to produce flowers (44 DAP), followed by Red Ripper (49 DAP) and Iron & Clay was the last (84-88 DAP) (see Appendix Table 26). Because the plants were harvested in the flowering stage, both Chinese Red and Red Ripper were harvested before Iron and Clay each year. Neither Rongai lablab nor velvet bean plants flowered before the plots were harvested in September (see Appendix Tables 7, 13, 19, and 25). In 2018, two of the lablab plots were left in place after the biomass harvest to determine a flowering date for this cultivar at Brooksville. We finally noticed flowers by mid-November (J. Grabowski, personal observation). In 2015, the velvet bean plots were destroyed prior to harvest due to poor stands in all plots. Common velvet bean yields in 2017 were the lowest of all vining legume cultivars and it was excluded from the study in 2018 (Table 3).

Lablab is highly recommended as a cover crop in Hawaii due to its ability to suppress weeds and control soil erosion. However, one disadvantage to using lablab as a cover crop is plants can be hosts for root-knot nematodes (Valenzuela and Smith, 2002). One-month canopy coverage in the common velvet bean plots ranged from 30% to 70% in the three years that it was planted, which was lower than the other vining legumes (Table 2). However, velvet bean plants are allelopathic to some weed species (Ferguson et al., 2003, Wang et al., 2006) and are also highly effective in reducing populations of several pathogenic nematodes (Krueger and McSorley, 2008). Some disadvantages to this species are that hairs present on the stems, leaves and seeds cause painful stinging and itching (Rich et al., 2003) and the large seeds are difficult to plant (Creamer and Baldwin, 2000; Wang et al., 2006).

C:N Ratios

Samples of the plant material from the biomass harvest were analyzed for total carbon and total nitrogen because the amount of these two elements in the tissue affects the rate of residue break down and can affect nutrient management of the subsequent cash crop. Microorganisms use nutrients, especially carbon and nitrogen, as a food source to break down cover crop residues. When there is a large amount of carbon in the residue and a small amount of nitrogen, the microorganisms utilize nitrogen from the surrounding soil to break down the tissue. The nitrogen becomes “immobilized” becomes it tied up in the microorganisms and is not available for plant growth until the microorganisms die. Whenever the ratio of the amounts of carbon and nitrogen (C:N ratio) in a cover crop residue exceeds 30:1, nitrogen immobilization will likely occur, and nitrogen fertilization of the cash crop will need to be adjusted. Because legumes have the capability to fix nitrogen, their residues tend to have low C:N ratios, so nitrogen immobilization is rarely a problem and their residues break down quickly (SARE, 2007).

As expected, the C:N ratios were less than 30:1 for all these warm-season cultivars, except for Tropic Sun sunn hemp in 2015 (Table 4). In later stages of growth, the stems of sunn hemp can become woody, which increases their carbon content (Rich et al., 2003). It has been reported

that residues of sunn hemp plants decompose more slowly than the other legumes with lower C:N ratios (Rich et al., 2003; SARE, 2007). Both red “mini” hemp and sesbania also have stems that become woody and fibrous as the plants age (Fern, No Date; Sheahan, 2013) and their C:N ratios also tended to be higher than several of the other legumes (Table 4). Based on

Table 4. Average C:N ratio of plant in plant tissue harvested from all warm-season legume study plots at the Brooksville Plant Materials Center.

Species	Cultivar	2015	2016	2017	2018
BUSHY					
Alyceclover	Common	23:1 ¹	26:1	22:1	- ²
Partridge Pea	Comanche	19:1	20:1	22:1	-
Partridge Pea	Lark	§ ³	17:1	§	-
Forage Soybean	Laredo	15:1	15:1	15:1	19:1
Forage Soybean	Large Lad	17:1	15:1	18:1	-
Pigeonpea	Georgia Two	18:1	20:1	17:1	-
Red “Mini” Hemp	Common	24:1	24:1	18:1	-
UPRIGHT					
Sesbania	Common	23:1	15:1	29:1	-
Sunn Hemp	AU Golden	17:1	14:1	18:1	-
Sunn Hemp	Common	16:1	22:1	19:1	21:1
Sunn Hemp	Tropic Sun	34:1	21:1	21:1	22:1
VINING					
Cowpea	Chinese Red	13:1	17:1	18:1	19:1
Cowpea	Iron & Clay	16:1	22:1	18:1	20:1
Cowpea	Red Ripper	15:1	17:1	17:1	18:1
Lablab	Rongai	20:1	17:1	19:1	19:1
Velvet Bean	Common	§	15:1	16:1	-

¹ C:N ratio calculated using total C and total N in plant samples measured by the Univ. Georgia Agricultural and Environmental Services Laboratories.

² Not planted in 2018.

³ No harvestable yield.

the C:N ratios reported in this study, residues of none of these legumes if harvested at the bloom stage, with the possible exception of Tropic Sun sunn hemp would have a negative effect on nitrogen availability for a following cash crop. In fact, because their residues break down quickly and release nitrogen that they fixed, they will have a beneficial effect on fertility of the cash crop.

CONCLUSIONS

All sunn hemp cultivars were vigorously growing plants that provided good canopy coverage and high biomass production. Although common sunn hemp was highly productive, because its origin and genetic identity are unknown, common seed purchased from other sources or even from the same source in the future may not exhibit similar performance. Tropic Sun is the most widely tested sunn hemp line and seed availability has improved in the last few years. A lack of commercial seed sources for AU Golden is a concern. Common red “mini” hemp also showed good potential for use as a cover crop in central Florida, but consistent seed supply is a major problem. The three cowpea cultivars provided superior canopy coverage. Iron & Clay produced

the most biomass and, because it was the latest flowering of the cowpeas, it would be the best selection when a long-term cover crop is needed. Red Ripper and Chinese Red, due to their earlier flowering, are better for situations with a shorter interval between cash crops. Rongai lablab was another vining legume that provided good canopy coverage and produced a great deal of biomass. The lablab plots that were planted in June did not flower until late fall, so there is little chance that this cultivar will set seed prior to termination. Common alyceclover plants provided good canopy coverage and biomass production, but seed availability is often limited.

Although they had good early canopy coverage, issues with declining yield across years for the forage soybeans, possibly related to seed quality, are unresolved at this time. For this reason, neither Laredo or Large Lad forage soybeans can be recommended as a cover crop at this location until further studies are conducted. Lark partridge pea failed to establish at this site and stands of Comanche partridge pea were insufficient to prevent early weed growth. Results for these partridge pea cultivars may have been improved if seed was scarified prior to planting, but most producers do not have the capability to scarify seed. The effect of increasing seeding rate on cover and yield needs to be determined. Both common sesbania and Georgia Two pigeon pea had poor early canopy cover but could be included in a mix with other cover crops to improve overall effectiveness at smothering weeds. Common velvet bean did not perform well in this study.

This study is the starting point in the evaluation of warm-season legumes for use as cover crops in central Florida. There are other potential legume species and additional cultivars of some of these species, especially cowpeas, that should be tested. A June planting date was chosen because it fit into the production calendar for several vegetable crops. Due to the diversity of crops that may be grown in the state and the length of the growing season, additional planting dates should be examined. Further research on termination dates and methods for these and other potential summer legume cover crops is also warranted. The seeding rates that we selected were based on recommendations from reputable sources; however, these rates may have been developed for growing these plants for seed or forage production rather than as cover crops. The slow canopy coverage of some of these cultivars, for example velvet bean, may be improved by increasing the seeding rate. Seed of warm-season legumes tends to be more expensive than many grasses. Therefore, research on these cover crops should include an analysis of the economics of using these warm-season legumes as cover crops.

Further research on using these species and cultivars in cover crops mixes is highly recommended. The author has observed in demonstration plantings at the PMC that the growth of sorghum-sudan [*Sorghum bicolor* (L. Moench) var. *bicolor* × *S. bicolor* ssp. *drummondii* (Nees ex Steud.) de Wet & Harlan] plants benefited from being grown with legumes, such as cowpea and sunn hemp. No nitrogen fertilizer was applied to these demonstration plantings, which indicates that the legumes in the mix were supplying the sorghum-sudan plants with the nitrogen they needed for growth. Additionally, the sorghum-sudan plants provided a structure for the cowpea plants to grow on, which increased ability of the cowpea plant's leaves to access more sunlight for photosynthesis. Sunn hemp and sesbania are upright legumes that can also be used as support for vining legumes. Several of the legume species included in this study either had no or a limited number of cultivars available for testing. A longer-term research project would be to develop new warm-season legume cultivars that have traits that improve their utility as cover crops.

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APPENDIX

2015 Data

Table 5. Emergence ratings at 7, 14, and 21 days after planting (DAP) for warm-season legume cover crop plots planted 11 June 2015 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	7 DAP	14 DAP	21 DAP
Alyceclover	Common	1	101	1 ¹	2	2 ²
Alyceclover	Common	2	203	2	2	2
Alyceclover	Common	3	302	2	1	1
Cowpea	Chinese Red	1	115	2	2	2
Cowpea	Chinese Red	2	208	2	2	2
Cowpea	Chinese Red	3	308	2	2	2
Cowpea	Iron & Clay	1	109	2	2	2
Cowpea	Iron & Clay	2	201	1	1	1
Cowpea	Iron & Clay	3	312	2	2	2
Cowpea	Red Ripper	1	112	1	1	1
Cowpea	Red Ripper	2	202	1	1	1
Cowpea	Red Ripper	3	313	1	2	2
Forage Soybean	Laredo	1	108	1	1	1
Forage Soybean	Laredo	2	216	1	1	1
Forage Soybean	Laredo	3	311	1	1	1
Forage Soybean	Large Lad	1	116	1	1	1
Forage Soybean	Large Lad	2	210	1	1	2
Forage Soybean	Large Lad	3	306	2	2	2
Lablab	Rongai	1	107	1	1	1
Lablab	Rongai	2	209	1	1	1
Lablab	Rongai	3	305	1	1	1
Partridge Pea	Comanche	1	106	0	0	0
Partridge Pea	Comanche	2	204	0	0	0
Partridge Pea	Comanche	3	315	0	0	0
Partridge Pea	Lark	1	113	0	0	0
Partridge Pea	Lark	2	212	0	0	0
Partridge Pea	Lark	3	310	0	0	0
Pigeonpea	Georgia Two	1	111	0	1	1
Pigeonpea	Georgia Two	2	215	0	0	1
Pigeonpea	Georgia Two	3	314	0	0	1
Red "Mini" Hemp	Common	1	104	1	1	1
Red "Mini" Hemp	Common	2	205	1	1	1
Red "Mini" Hemp	Common	3	303	0	0	0
Sesbania	Common	1	114	1	1	1
Sesbania	Common	2	214	1	1	1
Sesbania	Common	3	304	1	1	1
Sunn Hemp	AU Golden	1	102	1	1	1
Sunn Hemp	AU Golden	2	213	1	1	1
Sunn Hemp	AU Golden	3	309	1	1	1
Sunn Hemp	Common	1	103	1	1	1
Sunn Hemp	Common	2	206	1	1	1
Sunn Hemp	Common	3	301	1	1	1

Species	Cultivar	Rep	Plot	7 DAP	14 DAP	21 DAP
Sunn Hemp	Tropic Sun	1	105	0	1	0
Sunn Hemp	Tropic Sun	2	211	1	1	1
Sunn Hemp	Tropic Sun	3	316	1	1	1
Velvet Bean	Common	1	110	1	1	1
Velvet Bean	Common	2	207	0	0	0
Velvet Bean	Common	3	307	0	0	0

¹ Rating Scale - 0 = Poor (<25%); 1 = Moderate (30-60%); 2 = Good (65-85%); 3 = Excellent (90-100%).

² Accurately rating emergence at 21 days was difficult because plants were branching.

Table 6. Vigor and canopy ratings at 28 and 42 days after planting (DAP) for warm-season legume cover crop plots planted 11 June 2015 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	28 DAP		42 DAP	
				Vigor ¹	Canopy ²	Vigor	Canopy
Alyceclover	Common	1	101	5	6	5	9.5
Alyceclover	Common	2	203	4	6	5	9.5
Alyceclover	Common	3	302	3	5	5	7
Cowpea	Chinese Red	1	115	5	8	5	10
Cowpea	Chinese Red	2	208	5	7	5	10
Cowpea	Chinese Red	3	308	5	7	5	10
Cowpea	Iron & Clay	1	109	5	8	5	10
Cowpea	Iron & Clay	2	201	5	8	5	10
Cowpea	Iron & Clay	3	312	5	7	5	10
Cowpea	Red Ripper	1	112	5	7	5	10
Cowpea	Red Ripper	2	202	5	7	5	10
Cowpea	Red Ripper	3	313	5	8	5	10
Forage Soybean	Laredo	1	108	4	4	4	5
Forage Soybean	Laredo	2	216	4	5	5	6
Forage Soybean	Laredo	3	311	4	4	4	6
Forage Soybean	Large Lad	1	116	4	5	4	6
Forage Soybean	Large Lad	2	210	4	5	5	6
Forage Soybean	Large Lad	3	306	4	5	5	6.5
Lablab	Rongai	1	107	5	6	5	8
Lablab	Rongai	2	209	4	7	5	10
Lablab	Rongai	3	305	5	5	5	9
Partridge Pea	Comanche	1	106	2	2	4	5
Partridge Pea	Comanche	2	204	1	2	3	3
Partridge Pea	Comanche	3	315	2	3	3	3
Partridge Pea	Lark	1	113	0	0	0	0
Partridge Pea	Lark	2	212	0	0	0	0
Partridge Pea	Lark	3	310	0	0	0	0
Pigeonpea	Georgia Two	1	111	3	2	3	3
Pigeonpea	Georgia Two	2	215	3	3	4	3
Pigeonpea	Georgia Two	3	314	2	4	3	4
Red "Mini" Hemp	Common	1	104	3	3	4	6
Red "Mini" Hemp	Common	2	205	2	3	4	4
Red "Mini" Hemp	Common	3	303	2	2	3	3

Species	Cultivar	Rep	Plot	28 DAP		42 DAP	
				Vigor ¹	Canopy ²	Vigor	Canopy
Sesbania	Common	1	114	4	6	4	6
Sesbania	Common	2	214	5	7	5	7
Sesbania	Common	3	304	4	6	4	6
Sunn Hemp	AU Golden	1	102	5	5	5	7
Sunn Hemp	AU Golden	2	213	5	6	5	6
Sunn Hemp	AU Golden	3	309	5	6	5	7
Sunn Hemp	Common	1	103	4	5	5	7
Sunn Hemp	Common	2	206	4	4	5	6
Sunn Hemp	Common	3	301	5	6	5	5.5
Sunn Hemp	Tropic Sun	1	105	4	5	5	6
Sunn Hemp	Tropic Sun	2	211	5	5	5	6
Sunn Hemp	Tropic Sun	3	316	5	4	5	4
Velvet Bean	Common	1	110	-----	-----	4	4
Velvet Bean	Common	2	207	1	2	4	3
Velvet Bean	Common	3	307	2	5	3	3

¹ Vigor scale 1-5 where 1=Poor; 2=Fair; 3=Good, 4=Very Good, and 5 = Excellent.

² Canopy scale 0-10 where 0 = less than 10%; 1=10%; 2=20% 3=30%; 4=40%, 5=50%; 6=60%; 7 = 70%; 8=80%; 9=90%; and 10 =100% cover.

Table 7. Plant height measured at harvest and dry matter (DM) yield of biomass harvested from warm-season legume cover crop plots planted 11 June 2015 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	Date	Height 1	Height 2	Height 3	DM Yield ² (lb/ac)
					-----in-----			
Alyceclover	Common	1	101	9/21/2015	55	51	47	11487
Alyceclover	Common	2	203	9/21/2015	51	47	38	6261
Alyceclover	Common	3	302	9/21/2015	39	47	55	4189
Cowpea	Chinese Red	1	115	7/23/2015	30	33	29	3715
Cowpea	Chinese Red	2	208	7/23/2015	26	33	30	3451
Cowpea	Chinese Red	3	308	7/23/2015	31	38	30	4027
Cowpea	Iron & Clay	1	109	8/21/2015	20	24	24	8854
Cowpea	Iron & Clay	2	201	8/21/2015	20	28	24	8260
Cowpea	Iron & Clay	3	312	8/21/2015	24	28	30	6425
Cowpea	Red Ripper	1	112	8/6/2015	22	26	25	5021
Cowpea	Red Ripper	2	202	8/6/2015	21	21	19	4583
Cowpea	Red Ripper	3	313	8/6/2015	18	22	21	4349
Forage Soybean	Laredo	1	108	8/6/2015	30	31	27	3793
Forage Soybean	Laredo	2	216	8/6/2015	34	38	29	3057
Forage Soybean	Laredo	3	311	8/6/2015	26	26	29	4949
Forage Soybean	Large Lad	1	116	8/6/2015	26	20	22	3525
Forage Soybean	Large Lad	2	210	8/6/2015	24	34	31	3986
Forage Soybean	Large Lad	3	306	8/6/2015	26	31	33	4173
Lablab ²	Rongai	1	107	9/21/2015	34	33	30	11742
Lablab	Rongai	2	209	9/21/2015	31	30	31	12614
Lablab	Rongai	3	305	9/21/2015	28	28	28	7376

Species	Cultivar	Rep	Plot	Date	Height 1	Height 2	Height 3	DM Yield ¹
					-----in-----			lb/ac
Partridge Pea	Comanche	1	106	8/21/2015	35	31	39	6894
Partridge Pea	Comanche	2	204	8/6/2015	30	20	26	2239
Partridge Pea	Comanche	3	315	8/21/2015	35	36	43	5293
Partridge Pea	Lark	1	113	-----	-----	-----	-----	-----
Partridge Pea	Lark	2	212	-----	-----	-----	-----	-----
Partridge Pea	Lark	3	310	-----	-----	-----	-----	-----
Pigeonpea	Georgia Two	1	111	8/21/2015	45	51	47	4554
Pigeonpea	Georgia Two	2	215	8/21/2015	39	51	43	4007
Pigeonpea	Georgia Two	3	314	8/21/2015	43	43	55	7366
Red "Mini" Hemp	Common	1	104	9/21/2015	93	102	96	19280
Red "Mini" Hemp	Common	2	205	9/21/2015	89	101	91	22253
Red "Mini" Hemp	Common	3	303	9/21/2015	79	71	75	16013
Sesbania	Common	1	114	8/6/2015	37	48	38	2096
Sesbania	Common	2	214	8/6/2015	36	54	44	3271
Sesbania	Common	3	304	8/6/2015	62	38	34	1365
Sunn Hemp	AU Golden	1	102	8/6/2015	52	58	65	16912
Sunn Hemp	AU Golden	2	213	8/6/2015	69	74	66	9465
Sunn Hemp	AU Golden	3	309	8/6/2015	58	66	68	5147
Sunn Hemp	Common	1	103	9/3/2015	87	91	87	18695
Sunn Hemp	Common	2	206	8/21/2015	91	98	94	22992
Sunn Hemp	Common	3	301	8/21/2015	98	91	94	10014
Sunn Hemp	Tropic Sun	1	105	9/21/2015	128	116	118	19424
Sunn Hemp	Tropic Sun	2	211	9/21/2015	148	152	150	35619
Sunn Hemp	Tropic Sun	3	316	9/21/2015	126	118	140	38924
Velvet Bean	Common	1	110	-----	-----	-----	-----	-----
Velvet Bean	Common	2	207	-----	-----	-----	-----	-----
Velvet Bean	Common	3	307	-----	-----	-----	-----	-----

¹ A 5.4 ft² (0.5 m²) area in the center of each 4' x 20' plot was harvested to determine yield. Plots were harvested when plants were in the 50% flower to early pod stage.

² Lablab plants were harvested in the vegetative stage because flower buds had not formed by the end of the study period.

Table 8. Carbon and nitrogen content determined by tissue analysis of plant material harvested from warm-season legume cover crop plots planted 11 June 2015 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	Total C	Total N
				-----%-----	
Alyceclover	Common	1	101	45.42	2.13
Alyceclover	Common	2	203	46.64	1.89
Alyceclover	Common	3	302	46.11	1.93
Cowpea	Chinese Red	1	115	44.08	3.53
Cowpea	Chinese Red	2	208	44.29	3.76
Cowpea	Chinese Red	3	308	43.49	3.08
Cowpea	Iron & Clay	1	109	43.41	2.87

Species	Cultivar	Rep	Plot	Total C	Total N
				-----%-----	
Cowpea	Iron & Clay	2	201	43.53	2.78
Cowpea	Iron & Clay	3	312	43.76	2.51
Cowpea	Red Ripper	1	112	43.56	2.57
Cowpea	Red Ripper	2	202	44.00	3.40
Cowpea	Red Ripper	3	313	43.55	2.90
Forage Soybean	Laredo	1	108	44.77	3.30
Forage Soybean	Laredo	2	216	44.22	2.97
Forage Soybean	Laredo	3	311	44.34	2.73
Forage Soybean	Large Lad	1	116	43.84	2.90
Forage Soybean	Large Lad	2	210	44.30	2.35
Forage Soybean	Large Lad	3	306	44.17	2.67
Lablab	Rongai	1	107	43.82	2.02
Lablab	Rongai	2	209	44.63	2.41
Lablab	Rongai	3	305	43.94	2.29
Partridge Pea	Comanche	1	106	48.42	2.94
Partridge Pea	Comanche	2	204	47.48	2.69
Partridge Pea	Comanche	3	315	47.45	2.03
Partridge Pea	Lark	1	113	-----	-----
Partridge Pea	Lark	2	212	-----	-----
Partridge Pea	Lark	3	310	-----	-----
Pigeonpea	Georgia Two	1	111	47.73	2.43
Pigeonpea	Georgia Two	2	215	48.07	2.89
Pigeonpea	Georgia Two	3	314	47.08	2.62
Red "Mini" Hemp	Common	1	104	44.95	2.11
Red "Mini" Hemp	Common	2	205	46.27	1.45
Red "Mini" Hemp	Common	3	303	46.18	2.54
Sesbania	Common	1	114	43.41	1.83
Sesbania	Common	2	214	45.15	2.38
Sesbania	Common	3	304	42.55	1.57
Sunn Hemp	AU Golden	1	102	44.14	3.28
Sunn Hemp	AU Golden	2	213	45.50	2.24
Sunn Hemp	AU Golden	3	309	44.29	2.62
Sunn Hemp	Common	1	103	44.07	2.44
Sunn Hemp	Common	2	206	44.76	2.81
Sunn Hemp	Common	3	301	44.16	3.15
Sunn Hemp	Tropic Sun	1	105	45.93	0.89
Sunn Hemp	Tropic Sun	2	211	45.90	1.77
Sunn Hemp	Tropic Sun	3	316	45.36	1.79
Velvet Bean	Common	1	110	-----	-----
Velvet Bean	Common	2	207	-----	-----
Velvet Bean	Common	3	307	-----	-----

2016 Data

Table 9. Emergence ratings at 7 and 14 days after planting (DAP) for warm-season legume cover crop plots planted 23 June 2016 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	7 DAP	14 DAP
Alyceclover	Common	1	101	1 ¹	1
Alyceclover	Common	2	203	1	1
Alyceclover	Common	3	302	0	2
Cowpea	Chinese Red	1	115	1	3
Cowpea	Chinese Red	2	208	1	3
Cowpea	Chinese Red	3	308	1	3
Cowpea	Iron & Clay	1	109	1	3
Cowpea	Iron & Clay	2	201	1	3
Cowpea	Iron & Clay	3	312	1	3
Cowpea	Red Ripper	1	112	1	3
Cowpea	Red Ripper	2	202	1	2
Cowpea	Red Ripper	3	313	1	3
Forage Soybean	Laredo	1	108	1	1
Forage Soybean	Laredo	2	216	1	1
Forage Soybean	Laredo	3	311	1	2
Forage Soybean	Large Lad	1	116	1	2
Forage Soybean	Large Lad	2	210	1	2
Forage Soybean	Large Lad	3	306	1	2
Lablab	Rongai	1	107	1	2
Lablab	Rongai	2	209	1	2
Lablab	Rongai	3	305	1	2
Partridge Pea	Comanche	1	106	0	0
Partridge Pea	Comanche	2	204	0	0
Partridge Pea	Comanche	3	315	0	0
Partridge Pea	Lark	1	113	0	0
Partridge Pea	Lark	2	212	0	0
Partridge Pea	Lark	3	310	0	0
Pigeonpea	Georgia Two	1	111	0	0
Pigeonpea	Georgia Two	2	215	0	0
Pigeonpea	Georgia Two	3	314	0	1
Red "Mini" Hemp	Common	1	104	0	0
Red "Mini" Hemp	Common	2	205	1	0
Red "Mini" Hemp	Common	3	303	0	1
Sesbania	Common	1	114	1	3
Sesbania	Common	2	214	1	2
Sesbania	Common	3	304	0	2
Sunn Hemp	AU Golden	1	102	1	2
Sunn Hemp	AU Golden	2	213	1	2
Sunn Hemp	AU Golden	3	309	2	3
Sunn Hemp	Common	1	103	0	1
Sunn Hemp	Common	2	206	0	1
Sunn Hemp	Common	3	301	1	2
Sunn Hemp	Tropic Sun	1	105	0	1
Sunn Hemp	Tropic Sun	2	211	0	2

Species	Cultivar	Rep	Plot	7 DAP	14 DAP
Sunn Hemp	Tropic Sun	3	316	1	2
Velvet Bean	Common	1	110	0	2
Velvet Bean	Common	2	207	0	1
Velvet Bean	Common	3	307	0	1

¹ Rating Scale - 0 = Poor (<25%); 1 = Moderate (30-60%); 2 = Good (65-85%); 3 = Excellent (90-100%).

Table 10. Vigor and canopy ratings at 28, 42, and 50 days after planting (DAP) for warm-season legume cover crop plots planted 23 June 2016 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	28 DAP	42 DAP		50 DAP	
				Canopy ¹	Vigor ²	Canopy	Vigor	Canopy
Alyceclover	Common	1	101	5	3	9	3	9
Alyceclover	Common	2	203	8	3	7	3	9
Alyceclover	Common	3	302	8	4	10	3	9
Cowpea	Chinese Red	1	115	9	5	10	4	7
Cowpea	Chinese Red	2	208	8	5	10	4	7
Cowpea	Chinese Red	3	308	9	5	10	5	7
Cowpea	Iron & Clay	1	109	9	4	10	5	9
Cowpea	Iron & Clay	2	201	9	5	10	5	9
Cowpea	Iron & Clay	3	312	9	5	10	5	10
Cowpea	Red Ripper	1	112	9	5	10	5	9
Cowpea	Red Ripper	2	202	9	5	10	5	9
Cowpea	Red Ripper	3	313	9	4	10	5	7
Forage Soybean	Laredo	1	108	4	4	5	3	6
Forage Soybean	Laredo	2	216	4	3	5	3	4
Forage Soybean	Laredo	3	311	4	3	5	4	6
Forage Soybean	Large Lad	1	116	6	4	8	3	6
Forage Soybean	Large Lad	2	210	6	3	7	5	9
Forage Soybean	Large Lad	3	306	5	3	4	4	6
Lablab	Rongai	1	107	8	4	7	4	9
Lablab	Rongai	2	209	8	3	7	4	7
Lablab	Rongai	3	305	8	4	7	5	7
Partridge Pea	Comanche	1	106	2	4	5	4	6
Partridge Pea	Comanche	2	204	1	3	3	3	3
Partridge Pea	Comanche	3	315	0	3	5	4	2
Partridge Pea	Lark	1	113	0	2	1	3	0
Partridge Pea	Lark	2	212	0	2	1	4	0
Partridge Pea	Lark	3	310	0	3	2	2	1
Pigeonpea	Georgia Two	1	111	1	3	4	4	3
Pigeonpea	Georgia Two	2	215	2	3	4	4	3
Pigeonpea	Georgia Two	3	314	2	3	4	4	3
Red "Mini" Hemp	Common	1	104	2	4	5	4	6
Red "Mini" Hemp	Common	2	205	2	2	2	3	2
Red "Mini" Hemp	Common	3	303	1	2	4	3	3
Sesbania	Common	1	114	8	5	8	4	7
Sesbania	Common	2	214	5	3	5	3	3
Sesbania	Common	3	304	6	3	5	3	4

Species	Cultivar	Rep	Plot	28 DAP	42 DAP		50 DAP	
				Canopy ¹	Vigor ²	Canopy	Vigor	Canopy
Sunn Hemp	AU Golden	1	102	5	5	7	5	8
Sunn Hemp	AU Golden	2	213	7	4	7	5	7
Sunn Hemp	AU Golden	3	309	6	4	7	5	7
Sunn Hemp	Common	1	103	6	5	8	5	7
Sunn Hemp	Common	2	206	6	4	7	4	7
Sunn Hemp	Common	3	301	5	4	7	5	6
Sunn Hemp	Tropic Sun	1	105	7	4	7	5	7
Sunn Hemp	Tropic Sun	2	211	6	4	7	4	7
Sunn Hemp	Tropic Sun	3	316	6	4	7	5	5
Velvet Bean	Common	1	110	5	4	7	3	5
Velvet Bean	Common	2	207	2	2	4	3	4
Velvet Bean	Common	3	307	2	3	5	4	4

¹ Canopy scale 0-10 where 0 = less than 10%; 1 = 10%; 2 = 20% 3 = 30%; 4 = 40%, 5 = 50%; 6 = 60%; 7 = 70%; 8 = 80%; 9 = 90%; and 10 = 100% cover.

² Vigor scale 1-5 where 1 = Poor; 2 = Fair; 3 = Good, 4 = Very Good, and 5 = Excellent.

Table 11. Insect and disease damage ratings at 28, 42, and 50 days after planting (DAP) for warm-season legume cover crop plots planted 23 June 2016 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	28 DAP		42 DAP		50 DAP	
				Insect ¹	Disease ¹	Insect	Disease	Insect	Disease
Alyceclover	Common	1	101	0	0	1	2	1	2
Alyceclover	Common	2	203	0	0	1	2	1	2
Alyceclover	Common	3	302	0	0	1	2	1	2
Cowpea	Chinese Red	1	115	1	1	1	2	2	2
Cowpea	Chinese Red	2	208	1	2	1	2	2	2
Cowpea	Chinese Red	3	308	1	1	2	2	2	2
Cowpea	Iron & Clay	1	109	1	1	0	1	2	2
Cowpea	Iron & Clay	2	201	0	1	1	1	1	1
Cowpea	Iron & Clay	3	312	0	0	1	2	2	2
Cowpea	Red Ripper	1	112	0	0	1	1	2	2
Cowpea	Red Ripper	2	202	0	0	1	1	2	2
Cowpea	Red Ripper	3	313	1	2	1	1	2	2
Forage Soybean	Laredo	1	108	0	0	2	2	2	2
Forage Soybean	Laredo	2	216	0	0	1	2	2	2
Forage Soybean	Laredo	3	311	0	1	1	1	2	2
Forage Soybean	Large Lad	1	116	0	0	1	1	1	1
Forage Soybean	Large Lad	2	210	0	0	1	1	2	2
Forage Soybean	Large Lad	3	306	0	0	1	1	2	2
Lablab ²	Rongai	1	107	1	0	2	2	2	2
Lablab	Rongai	2	209	2	0	2	2	2	2
Lablab	Rongai	3	305	0	0	1	1	2	2
Partridge Pea	Comanche	1	106	0	0	0	0	0	0
Partridge Pea	Comanche	2	204	0	0	0	0	0	0
Partridge Pea	Comanche	3	315	0	0	0	0	0	0
Partridge Pea	Lark	1	113	0	0	0	0	0	0
Partridge Pea	Lark	2	212	0	0	0	0	0	0

Species	Cultivar	Rep	Plot	28 DAP		42 DAP		50 DAP	
				Insect ¹	Disease ¹	Insect	Disease	Insect	Disease
Partridge Pea	Lark	3	310	0	0	0	0	0	0
Pigeonpea	Georgia Two	1	111	1	1	1	1	1	1
Pigeonpea	Georgia Two	2	215	0	0	1	1	0	2
Pigeonpea	Georgia Two	3	314	0	0	1	1	1	2
Red "Mini" Hemp	Common	1	104	2	2	1	1	1	1
Red "Mini" Hemp	Common	2	205	0	0	0	1	0	1
Red "Mini" Hemp	Common	3	303	1	1	0	1	1	2
Sesbania	Common	1	114	0	0	0	1	1	1
Sesbania	Common	2	214	0	1	0	2	0	0
Sesbania	Common	3	304	0	0	0	1	0	0
Sunn Hemp	AU Golden	1	102	1	1	1	1	0	0
Sunn Hemp	AU Golden	2	213	1	2	0	2	1	2
Sunn Hemp	AU Golden	3	309	0	1	1	2	1	2
Sunn Hemp	Common	1	103	1	1	1	1	1	2
Sunn Hemp	Common	2	206	0	1	1	1	1	2
Sunn Hemp	Common	3	301	0	1	1	1	1	2
Sunn Hemp	Tropic Sun	1	105	1	1	1	1	1	2
Sunn Hemp	Tropic Sun	2	211	1	2	0	2	1	2
Sunn Hemp	Tropic Sun	3	316	1	1	1	1	1	2
Velvet Bean ²	Common	1	110	0	0	2	1	2	2
Velvet Bean	Common	2	207	0	0	1	1	2	2
Velvet Bean	Common	3	307	0	0	1	1	2	2

¹ Insect and disease rating scale 0-5 where 0 = No Damage and 5 = Severe Damage.

Table 12. Flowering observations at 42 and 50 days after planting (DAP) for warm-season legume cover crop plots planted 23 June 2016 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	42 DAP	50 DAP
Alyceclover	Common	1	101	0 ¹	0
Alyceclover	Common	2	203	0	0
Alyceclover	Common	3	302	0	0
Cowpea	Chinese Red	1	115	BL	BL
Cowpea	Chinese Red	2	208	BL	BL
Cowpea	Chinese Red	3	308	BL	BL
Cowpea	Iron & Clay	1	109	0	0
Cowpea	Iron & Clay	2	201	0	0
Cowpea	Iron & Clay	3	312	0	0
Cowpea	Red Ripper	1	112	BL	BL
Cowpea	Red Ripper	2	202	BL	BL
Cowpea	Red Ripper	3	313	BL	BL
Forage Soybean	Laredo	1	108	BL	BL
Forage Soybean	Laredo	2	216	BL	BL
Forage Soybean	Laredo	3	311	BL	BL
Forage Soybean	Large Lad	1	116	0	0
Forage Soybean	Large Lad	2	210	0	0
Forage Soybean	Large Lad	3	306	0	0
Lablab	Rongai	1	107	0	0

Species	Cultivar	Rep	Plot	42 DAP	50 DAP
Lablab	Rongai	2	209	0	0
Lablab	Rongai	3	305	0	0
Partridge Pea	Comanche	1	106	0	0
Partridge Pea	Comanche	2	204	0	0
Partridge Pea	Comanche	3	315	0	0
Partridge Pea	Lark	1	113	0	0
Partridge Pea	Lark	2	212	0	0
Partridge Pea	Lark	3	310	0	0
Pigeonpea	Georgia Two	1	111	0	0
Pigeonpea	Georgia Two	2	215	0	0
Pigeonpea	Georgia Two	3	314	0	0
Red "Mini" Hemp	Common	1	104	0	0
Red "Mini" Hemp	Common	2	205	0	0
Red "Mini" Hemp	Common	3	303	0	0
Sesbania	Common	1	114	BL	BL
Sesbania	Common	2	214	0	0
Sesbania	Common	3	304	0	0
Sunn Hemp	AU Golden	1	102	BL	BL
Sunn Hemp	AU Golden	2	213	BL	BL
Sunn Hemp	AU Golden	3	309	BL	BL
Sunn Hemp	Common	1	103	BL	BL
Sunn Hemp	Common	2	206	0	0
Sunn Hemp	Common	3	301	BL	BL
Sunn Hemp	Tropic Sun	1	105	BL	BL
Sunn Hemp	Tropic Sun	2	211	BL	BL
Sunn Hemp	Tropic Sun	3	316	0	0
Velvet Bean	Common	1	110	0	0
Velvet Bean	Common	2	207	0	0
Velvet Bean	Common	3	307	0	0

Flowering rating – 0 = Vegetative stage; BL = Blooming, flowers fully exerted.

Table 13. Plant height measured at harvest and dry matter (DM) yield of biomass harvested from warm-season legume cover crop plots planted 23 June 2016 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	Date	Height 1	Height 2	Height 3	DM Yield ²
					-----in-----			lb/ac
Alyceclover	Common	1	101	9/27/2016	55	51	47	2382
Alyceclover	Common	2	203	9/27/2016	35	35	35	762
Alyceclover	Common	3	302	9/27/2016	28	39	51	734
Cowpea	Chinese Red	1	115	8/12/2016	24	22	24	1408
Cowpea	Chinese Red	2	208	8/12/2016	31	20	22	1150
Cowpea	Chinese Red	3	308	8/12/2016	24	31	24	2697
Cowpea	Iron & Clay	1	109	9/27/2016	12	20	20	3983
Cowpea	Iron & Clay	2	201	9/27/2016	16	20	24	5776
Cowpea	Iron & Clay	3	312	9/27/2016	35	31	20	3042
Cowpea	Red Ripper	1	112	8/12/2016	20	24	18	2348
Cowpea	Red Ripper	2	202	8/12/2016	20	16	19	1585

Species	Cultivar	Rep	Plot	Date	Height 1	Height 2	Height 3	DM Yield ²
					-----in-----			lb/ac
Cowpea	Red Ripper	3	313	8/25/2016	28	24	20	1961
Forage Soybean	Laredo	1	108	8/12/2016	18	24	28	1216
Forage Soybean	Laredo	2	216	8/12/2016	18	24	15	929
Forage Soybean	Laredo	3	311	8/12/2016	22	22	20	1510
Forage Soybean	Large Lad	1	116	8/12/2016	20	20	12	1477
Forage Soybean	Large Lad	2	210	8/12/2016	28	26	24	1291
Forage Soybean	Large Lad	3	306	8/12/2016	24	14	14	629
Lablab ²	Rongai	1	107	9/27/2016	18	22	16	2778
Lablab	Rongai	2	209	9/27/2016	16	20	51	1771
Lablab	Rongai	3	305	9/27/2016	20	16	35	1476
Partridge Pea	Comanche	1	106	8/25/2016	35	31	35	1097
Partridge Pea	Comanche	2	204	8/25/2016	35	28	24	1693
Partridge Pea	Comanche	3	315	8/25/2016	35	28	31	1323
Partridge Pea	Lark	1	113	8/12/2016	24	24	-----	428
Partridge Pea	Lark	2	212	8/25/2016	24	-----	-----	222
Partridge Pea	Lark	3	310	8/25/2016	31	20	16	418
Pigeonpea	Georgia Two	1	111	8/25/2016	43	35	39	1171
Pigeonpea	Georgia Two	2	215	8/25/2016	35	31	31	844
Pigeonpea	Georgia Two	3	314	8/25/2016	35	35	31	1517
Red "Mini" Hemp	Common	1	104	9/27/2016	67	63	63	2428
Red "Mini" Hemp	Common	2	205	9/27/2016	51	43	35	488
Red "Mini" Hemp	Common	3	303	9/27/2016	55	35	35	978
Sesbania	Common	1	114	8/12/2016	67	43	43	2188
Sesbania	Common	2	214	8/12/2016	47	23	20	336
Sesbania	Common	3	304	8/12/2016	16	35	30	971
Sunn Hemp	AU Golden	1	102	8/12/2016	67	102	55	4476
Sunn Hemp	AU Golden	2	213	8/12/2016	63	67	47	831
Sunn Hemp	AU Golden	3	309	8/12/2016	67	71	55	2389
Sunn Hemp	Common	1	103	8/25/2016	71	75	71	3027
Sunn Hemp	Common	2	206	8/25/2016	63	67	67	6664
Sunn Hemp	Common	3	301	8/25/2016	71	67	71	6191
Sunn Hemp	Tropic Sun	1	105	8/25/2016	71	83	67	5663
Sunn Hemp	Tropic Sun	2	211	8/25/2016	59	63	87	1279
Sunn Hemp	Tropic Sun	3	316	8/25/2016	71	67	75	5485
Velvet Bean ²	Common	1	110	9/27/2016	28	35	31	4743
Velvet Bean	Common	2	207	9/27/2016	28	16	35	732
Velvet Bean	Common	3	307	9/27/2016	20	20	17	2714

¹ A 5.4 ft² (0.5 m²) area in the center of each 4' x 20' plot was harvested to determine yield. Plots were harvested when plants were in the 50% flower to early pod stage.

² Lablab and velvet bean plants were harvested in the vegetative stage because flower buds had not formed by the end of the study period.

Table 14. Carbon and nitrogen content determined by tissue analysis of plant material harvested from warm-season legume cover crop plots planted 23 June 2016 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	Total C	Total N
-----%-----					
Alyceclover	Common	1	101	47.87	1.77
Alyceclover	Common	2	203	49.75	2.04
Alyceclover	Common	3	302	46.78	1.74
Cowpea	Chinese Red	1	115	46.52	2.58
Cowpea	Chinese Red	2	208	46.75	3.20
Cowpea	Chinese Red	3	308	44.06	2.41
Cowpea	Iron & Clay	1	109	47.35	1.56
Cowpea	Iron & Clay	2	201	47.32	2.49
Cowpea	Iron & Clay	3	312	43.68	2.44
Cowpea	Red Ripper	1	112	46.32	2.26
Cowpea	Red Ripper	2	202	46.86	3.55
Cowpea	Red Ripper	3	313	43.65	2.65
Forage Soybean	Laredo	1	108	46.31	2.79
Forage Soybean	Laredo	2	216	47.13	3.34
Forage Soybean	Laredo	3	311	44.09	3.02
Forage Soybean	Large Lad	1	116	45.81	3.17
Forage Soybean	Large Lad	2	210	47.85	3.25
Forage Soybean	Large Lad	3	306	42.60	2.48
Lablab	Rongai	1	107	47.10	2.79
Lablab	Rongai	2	209	48.24	2.17
Lablab	Rongai	3	305	44.68	2.27
Partridge Pea	Comanche	1	106	51.85	2.97
Partridge Pea	Comanche	2	204	51.79	2.53
Partridge Pea	Comanche	3	315	48.46	2.25
Partridge Pea	Lark	1	113	51.29	3.75
Partridge Pea	Lark	2	212	51.02	2.89
Partridge Pea	Lark	3	310	49.02	2.45
Pigeonpea	Georgia Two	1	111	50.08	2.54
Pigeonpea	Georgia Two	2	215	50.80	2.79
Pigeonpea	Georgia Two	3	314	48.01	2.15
Red "Mini" Hemp	Common	1	104	48.14	1.60
Red "Mini" Hemp	Common	2	205	49.22	1.58
Red "Mini" Hemp	Common	3	303	45.97	4.47
Sesbania	Common	1	114	48.18	2.37
Sesbania	Common	2	214	48.30	4.21
Sesbania	Common	3	304	46.61	3.63
Sunn Hemp	AU Golden	1	102	47.10	3.15
Sunn Hemp	AU Golden	2	213	48.37	3.37
Sunn Hemp	AU Golden	3	309	44.97	3.31
Sunn Hemp	Common	1	103	48.25	2.02
Sunn Hemp	Common	2	206	48.76	2.15
Sunn Hemp	Common	3	301	43.62	2.37
Sunn Hemp	Tropic Sun	1	105	47.86	2.42
Sunn Hemp	Tropic Sun	2	211	48.47	1.88

Species	Cultivar	Rep	Plot	Total C	Total N
				-----%-----	
Sunn Hemp	Tropic Sun	3	316	44.18	2.56
Velvet Bean	Common	1	110	48.26	4.26
Velvet Bean	Common	2	207	49.59	2.83
Velvet Bean	Common	3	307	46.98	2.85

2017 Data

Table 15. Emergence ratings at 7, 14, and 21 days after planting (DAP) for warm-season legume cover crop plots planted 21 June 2017 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	7 DAP	14 DAP	21 DAP	Notes
Alyceclover	Common	1	106	0 ¹	1	1 ²	
Alyceclover	Common	2	203	0	1	1	
Alyceclover	Common	3	302	0	1	1	
Cowpea	Chinese Red	1	113	1	1	3	14 DAP insect damage
Cowpea	Chinese Red	2	208	1	1	2	
Cowpea	Chinese Red	3	308	1	3	3	
Cowpea	Iron & Clay	1	112	1	1	1	14 DAP insect damage
Cowpea	Iron & Clay	2	201	1	1	1	
Cowpea	Iron & Clay	3	312	1	1	1	14 DAP insect damage
Cowpea	Red Ripper	1	111	1	1	0	14 DAP insect damage
Cowpea	Red Ripper	2	202	1	2	2	
Cowpea	Red Ripper	3	313	1	1	3	14 DAP insect damage
Forage Soybean	Laredo	1	108	1	1	3	
Forage Soybean	Laredo	2	216	1	1	1	
Forage Soybean	Laredo	3	310	1	1	1	
Forage Soybean	Large Lad	1	107	1	1	1	14 DAP insect damage
Forage Soybean	Large Lad	2	210	1	1	1	
Forage Soybean	Large Lad	3	306	1	1	1	14 DAP insect damage
Lablab	Rongai	1	116	1	1	1	14 DAP insect damage
Lablab	Rongai	2	209	1	1	2	14 DAP insect damage
Lablab	Rongai	3	305	1	1	1	
Partridge Pea	Comanche	1	115	0	0	0	
Partridge Pea	Comanche	2	204	0	0	0	
Partridge Pea	Comanche	3	315	0	0	0	
Partridge Pea	Lark	1	114	0	0	1	
Partridge Pea	Lark	2	212	0	0	0	
Partridge Pea	Lark	3	311	0	0	0	
Pigeonpea	Georgia Two	1	105	1	1	1	
Pigeonpea	Georgia Two	2	215	0	1	2	
Pigeonpea	Georgia Two	3	314	1	1	1	
Red "Mini" Hemp	Common	1	104	0	1	1	
Red "Mini" Hemp	Common	2	205	0	1	1	
Red "Mini" Hemp	Common	3	303	0	1	1	
Sesbania	Common	1	109	1	1	1	
Sesbania	Common	2	214	1	1	2	
Sesbania	Common	3	304	1	1	1	
Sunn Hemp	AU Golden	1	101	1	3	1	
Sunn Hemp	AU Golden	2	213	1	1	2	
Sunn Hemp	AU Golden	3	309	1	1	1	
Sunn Hemp	Common	1	102	1	1	1	
Sunn Hemp	Common	2	206	1	1	2	
Sunn Hemp	Common	3	301	1	1	1	
Sunn Hemp	Tropic Sun	1	103	1	1	1	
Sunn Hemp	Tropic Sun	2	211	1	1	1	

Sunn Hemp	Tropic Sun	3	316	1	1	1	
Velvet Bean	Common	1	110	1	3	1	
Velvet Bean	Common	2	207	1	1	2	
Velvet Bean	Common	3	307	1	1	1	

¹ Rating Scale - 0 = Poor (<25%); 1 = Moderate (30-60%); 2 = Good (65-85%); 3 = Excellent (90-100%).

² Accurately rating emergence at 21 days was difficult because plants were branching.

Table 16. Canopy ratings at 10, 20, and 30 days after planting (DAP) for warm-season legume cover crop plots planted 21 June 2017 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	10 DAP	20 DAP	30 DAP
Alyceclover	Common	1	106	0	3	6
Alyceclover	Common	2	203	0	3	3
Alyceclover	Common	3	302	0	6	6
Cowpea	Chinese Red	1	113	6	6	9
Cowpea	Chinese Red	2	208	6	6	7
Cowpea	Chinese Red	3	308	6	9	9
Cowpea	Iron & Clay	1	112	3	3	7
Cowpea	Iron & Clay	2	201	3	3	6
Cowpea	Iron & Clay	3	312	6	6	6
Cowpea	Red Ripper	1	111	6	6	9
Cowpea	Red Ripper	2	202	6	7	7
Cowpea	Red Ripper	3	313	3	6	9
Forage Soybean	Laredo	1	108	3	3	6
Forage Soybean	Laredo	2	216	3	3	3
Forage Soybean	Laredo	3	310	3	3	3
Forage Soybean	Large Lad	1	107	3	6	6
Forage Soybean	Large Lad	2	210	3	3	6
Forage Soybean	Large Lad	3	306	3	3	3
Lablab	Rongai	1	116	3	6	7
Lablab	Rongai	2	209	3	6	7
Lablab	Rongai	3	305	6	6	6
Partridge Pea	Comanche	1	115	0	0	0
Partridge Pea	Comanche	2	204	0	0	0
Partridge Pea	Comanche	3	315	0	0	0
Partridge Pea	Lark	1	114	0	0	0
Partridge Pea	Lark	2	212	0	0	0
Partridge Pea	Lark	3	311	0	0	0
Pigeonpea	Georgia Two	1	105	3	3	6
Pigeonpea	Georgia Two	2	215	0	6	7
Pigeonpea	Georgia Two	3	314	3	3	3
Red "Mini" Hemp	Common	1	104	0	3	3
Red "Mini" Hemp	Common	2	205	0	3	3
Red "Mini" Hemp	Common	3	303	0	3	3
Sesbania	Common	1	109	3	6	6
Sesbania	Common	2	214	6	6	7
Sesbania	Common	3	304	6	6	6
Sunn Hemp	AU Golden	1	101	6	9	9

Species	Cultivar	Rep	Plot	10 DAP	20 DAP	30 DAP
Sunn Hemp	AU Golden	2	213	3	6	7
Sunn Hemp	AU Golden	3	309	6	6	6
Sunn Hemp	Common	1	102	3	6	7
Sunn Hemp	Common	2	206	3	6	7
Sunn Hemp	Common	3	301	3	6	6
Sunn Hemp	Tropic Sun	1	103	3	6	7
Sunn Hemp	Tropic Sun	2	211	3	6	6
Sunn Hemp	Tropic Sun	3	316	3	6	6
Velvet Bean	Common	1	110	6	9	9
Velvet Bean	Common	2	207	6	6	7
Velvet Bean	Common	3	307	3	6	6

¹ Canopy scale 0-10 where 0 = less than 10%; 1 = 10%; 2 = 20% 3 = 30%; 4 = 40%, 5 = 50%; 6 = 60%; 7 = 70%; 8 = 80%; 9 = 90%; and 10 = 100% cover.

Table 17. Canopy ratings and plant height measurements at 40, 50, 60, 70, 80 and 100 days after planting (DAP) for warm-season legume cover crop plots planted 21 June 2017 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	40 DAP			
				Canopy ¹	Height 1	Height 2	Height 3
					-----in-----		
Alyceclover	Common	1	106	3	12	13	12
Alyceclover	Common	2	203	1	13	12	14
Alyceclover	Common	3	302	5	14	18	16
Cowpea	Chinese Red	1	113	10	28	26	27
Cowpea	Chinese Red	2	208	10	28	26	28
Cowpea	Chinese Red	3	308	10	24	32	29
Cowpea	Iron & Clay	1	112	10	28	24	30
Cowpea	Iron & Clay	2	201	10	29	28	30
Cowpea	Iron & Clay	3	312	10	30	34	32
Cowpea	Red Ripper	1	111	10	21	22	24
Cowpea	Red Ripper	2	202	10	24	22	24
Cowpea	Red Ripper	3	313	10	20	22	24
Forage Soybean	Laredo	1	108	5	10	14	12
Forage Soybean	Laredo	2	216	4	10	8	9
Forage Soybean	Laredo	3	310	7	25	27	30
Forage Soybean	Large Lad	1	107	6	11	12	14
Forage Soybean	Large Lad	2	210	5	9	10	8
Forage Soybean	Large Lad	3	306	4	12	12	14
Lablab	Rongai	1	116	10	26	28	25
Lablab	Rongai	2	209	10	29	28	26
Lablab	Rongai	3	305	8	24	26	24
Partridge Pea	Comanche	1	115	3	14	14	14
Partridge Pea	Comanche	2	204	3	10	12	11
Partridge Pea	Comanche	3	315	5	12	14	12
Partridge Pea	Lark	1	114	0	0	0	0
Partridge Pea	Lark	2	212	0	15	0	0
Partridge Pea	Lark	3	311	0	0	0	0

Species	Cultivar	Rep	Plot	Canopy ¹	Height 1	Height 2	Height 3
					-----in-----		
Pigeonpea	Georgia Two	1	105	2	23	24	26
Pigeonpea	Georgia Two	2	215	3	28	29	30
Pigeonpea	Georgia Two	3	314	5	21	28	26
Red "Mini" Hemp	Common	1	104	3	22	24	24
Red "Mini" Hemp	Common	2	205	3	15	14	12
Red "Mini" Hemp	Common	3	303	6	25	24	23
Sesbania	Common	1	109	8	22	18	20
Sesbania	Common	2	214	9	24	28	30
Sesbania	Common	3	304	8	14	16	14
Sunn Hemp	AU Golden	1	101	10	56	58	54
Sunn Hemp	AU Golden	2	213	10	48	56	58
Sunn Hemp	AU Golden	3	309	10	56	58	57
Sunn Hemp	Common	1	102	10	48	56	58
Sunn Hemp	Common	2	206	8	36	38	48
Sunn Hemp	Common	3	301	10	52	48	50
Sunn Hemp	Tropic Sun	1	103	9	56	48	50
Sunn Hemp	Tropic Sun	2	211	8	36	46	48
Sunn Hemp	Tropic Sun	3	316	10	48	52	50
Velvet Bean	Common	1	110	8	18	20	22
Velvet Bean	Common	2	207	5	14	13	16
Velvet Bean	Common	3	307	6	20	24	28
					50 DAP		
Alyceclover	Common	1	106	3	16	14	15
Alyceclover	Common	2	203	3	16	18	16
Alyceclover	Common	3	302	5	20	22	24
Cowpea	Chinese Red	1	113	10	36	34	36
Cowpea	Chinese Red	2	208	10	36	28	36
Cowpea	Chinese Red	3	308	10	36	40	38
Cowpea	Iron & Clay	1	112	10	36	28	42
Cowpea	Iron & Clay	2	201	10	36	36	38
Cowpea	Iron & Clay	3	312	10	36	40	38
Cowpea	Red Ripper	1	111	10	24	28	28
Cowpea	Red Ripper	2	202	10	24	26	24
Cowpea	Red Ripper	3	313	10	22	26	24
Forage Soybean	Laredo	1	108	5	18	14	16
Forage Soybean	Laredo	2	216	3	15	14	12
Forage Soybean	Laredo	3	310	8	30	28	32
Forage Soybean	Large Lad	1	107	6	15	18	16
Forage Soybean	Large Lad	2	210	6	10	12	8
Forage Soybean	Large Lad	3	306	2	12	10	12
Lablab	Rongai	1	116	10	32	28	34
Lablab	Rongai	2	209	10	27	24	28
Lablab	Rongai	3	305	9	24	26	30
Partridge Pea	Comanche	1	115	2	14	14	14
Partridge Pea	Comanche	2	204	1	14	14	16
Partridge Pea	Comanche	3	315	7	15	18	16

Species	Cultivar	Rep	Plot	50 DAP			
				Canopy ¹	Height 1	Height 2	Height 3
					-----in-----		
Partridge Pea	Lark	1	114	0	----	----	----
Partridge Pea	Lark	2	212	1	16	11	12
Partridge Pea	Lark	3	311	0	----	----	----
Pigeonpea	Georgia Two	1	105	3	26	24	26
Pigeonpea	Georgia Two	2	215	3	30	36	28
Pigeonpea	Georgia Two	3	314	4	25	28	24
Red "Mini" Hemp	Common	1	104	3	35	24	26
Red "Mini" Hemp	Common	2	205	3	14	16	14
Red "Mini" Hemp	Common	3	303	7	28	32	26
Sesbania	Common	1	109	7	24	28	30
Sesbania	Common	2	214	8	36	48	44
Sesbania	Common	3	304	7	22	16	18
Sunn Hemp	AU Golden	1	101	10	56	68	60
Sunn Hemp	AU Golden	2	213	10	66	64	58
Sunn Hemp	AU Golden	3	309	10	56	66	58
Sunn Hemp	Common	1	102	10	68	66	64
Sunn Hemp	Common	2	206	9	56	48	46
Sunn Hemp	Common	3	301	10	66	58	60
Sunn Hemp	Tropic Sun	1	103	10	72	66	68
Sunn Hemp	Tropic Sun	2	211	7	56	44	48
Sunn Hemp	Tropic Sun	3	316	10	62	56	58
Velvet Bean	Common	1	110	8	24	26	24
Velvet Bean	Common	2	207	5	16	14	12
Velvet Bean	Common	3	307	8	24	28	26
					60 DAP		
Alyceclover	Common	1	106	4	28	30	26
Alyceclover	Common	2	203	2	16	26	24
Alyceclover	Common	3	302	3	28	24	24
Cowpea	Chinese Red	1	113	10	36	41	33
Cowpea	Chinese Red	2	208	10	38	36	42
Cowpea	Chinese Red	3	308	10	36	48	38
Cowpea	Iron & Clay	1	112	10	26	36	28
Cowpea	Iron & Clay	2	201	10	38	28	36
Cowpea	Iron & Clay	3	312	10	36	32	34
Cowpea	Red Ripper	1	111	10	23	19	25
Cowpea	Red Ripper	2	202	10	18	18	20
Cowpea	Red Ripper	3	313	10	32	24	28
Forage Soybean	Laredo	1	108	6	18	25	25
Forage Soybean	Laredo	2	216	3	10	13	15
Forage Soybean	Laredo	3	310	8	12	16	18
Forage Soybean	Large Lad	1	107	9	20	25	31
Forage Soybean	Large Lad	2	210	1	13	12	10
Forage Soybean	Large Lad	3	306	2	12	13	16
Lablab	Rongai	1	116	10	32	30	28
Lablab	Rongai	2	209	10	30	30	28

Species	Cultivar	Rep	Plot	Canopy ¹	60 DAP		
					Height 1	Height 2	Height 3
					-----in-----		
Lablab	Rongai	3	305	10	38	34	34
Partridge Pea	Comanche	1	115	3	24	25	28
Partridge Pea	Comanche	2	204	2	28	24	19
Partridge Pea	Comanche	3	315	8	25	28	26
Partridge Pea	Lark	1	114	0	-----	-----	-----
Partridge Pea	Lark	2	212	0	-----	-----	-----
Partridge Pea	Lark	3	311	0	-----	-----	-----
Pigeonpea	Georgia Two	1	105	5	36	38	34
Pigeonpea	Georgia Two	2	215	6	36	38	36
Pigeonpea	Georgia Two	3	314	8	38	36	36
Red "Mini" Hemp	Common	1	104	5	36	46	48
Red "Mini" Hemp	Common	2	205	3	30	34	32
Red "Mini" Hemp	Common	3	303	6	42	38	36
Sesbania	Common	1	109	8	32	38	42
Sesbania	Common	2	214	9	36	42	56
Sesbania	Common	3	304	8	37	39	27
Sunn Hemp	AU Golden	1	101	10	65	72	56
Sunn Hemp	AU Golden	2	213	10	72	82	62
Sunn Hemp	AU Golden	3	309	10	72	82	75
Sunn Hemp	Common	1	102	10	88	92	88
Sunn Hemp	Common	2	206	9	72	56	68
Sunn Hemp	Common	3	301	9	76	96	84
Sunn Hemp	Tropic Sun	1	103	9	84	78	86
Sunn Hemp	Tropic Sun	2	211	9	72	52	68
Sunn Hemp	Tropic Sun	3	316	10	76	82	84
Velvet Bean	Common	1	110	10	32	34	32
Velvet Bean	Common	2	207	6	24	22	24
Velvet Bean	Common	3	307	7	24	26	22
					70 DAP		
Alyceclover	Common	1	106	3	34	28	24
Alyceclover	Common	2	203	2	28	16	24
Alyceclover	Common	3	302	4	28	36	28
Cowpea	Chinese Red	1	113	Harvested			
Cowpea	Chinese Red	2	208	Harvested			
Cowpea	Chinese Red	3	308	Harvested			
Cowpea	Iron & Clay	1	112	10	28	36	36
Cowpea	Iron & Clay	2	201	10	38	36	36
Cowpea	Iron & Clay	3	312	10	28	24	30
Cowpea	Red Ripper	1	111	Harvested			
Cowpea	Red Ripper	2	202	Harvested			
Cowpea	Red Ripper	3	313	Harvested			
Forage Soybean	Laredo	1	108	Harvested			
Forage Soybean	Laredo	2	216	Harvested			
Forage Soybean	Laredo	3	310	Harvested			
Forage Soybean	Large Lad	1	107	Harvested			

Species	Cultivar	Rep	Plot	Canopy ¹	70 DAP		
					Height 1	Height 2	Height 3
					-----in-----		
Forage Soybean	Large Lad	2	210	Harvested			
Forage Soybean	Large Lad	3	306	Harvested			
Lablab	Rongai	1	116	10	30	30	36
Lablab	Rongai	2	209	10	26	28	26
Lablab	Rongai	3	305	9	28	32	28
Partridge Pea	Comanche	1	115	5	32	32	34
Partridge Pea	Comanche	2	204	3	31	28	32
Partridge Pea	Comanche	3	315	9	32	36	28
Partridge Pea	Lark	1	114	0	-----	-----	-----
Partridge Pea	Lark	2	212	0	-----	-----	-----
Partridge Pea	Lark	3	311	0	-----	-----	-----
Pigeonpea	Georgia Two	1	105	5	36	38	36
Pigeonpea	Georgia Two	2	215	5	42	28	36
Pigeonpea	Georgia Two	3	314	8	46	48	46
Red "Mini" Hemp	Common	1	104	5	56	48	54
Red "Mini" Hemp	Common	2	205	7	34	36	32
Red "Mini" Hemp	Common	3	303	5	48	52	46
Sesbania	Common	1	109	Harvested			
Sesbania	Common	2	214	Harvested			
Sesbania	Common	3	304	Harvested			
Sunn Hemp	AU Golden	1	101	Harvested			
Sunn Hemp	AU Golden	2	213	Harvested			
Sunn Hemp	AU Golden	3	309	Harvested			
Sunn Hemp	Common	1	102	10	92	92	102
Sunn Hemp	Common	2	206	9	62	74	86
Sunn Hemp	Common	3	301	10	82	86	92
Sunn Hemp	Tropic Sun	1	103	10	86	92	86
Sunn Hemp	Tropic Sun	2	211	10	58	62	76
Sunn Hemp	Tropic Sun	3	316	10	102	82	92
Velvet Bean	Common	1	110	9	28	34	36
Velvet Bean	Common	2	207	5	26	24	26
Velvet Bean	Common	3	307	5	30	32	34
					80 DAP		
Alyceclover	Common	1	106	4	36	28	36
Alyceclover	Common	2	203	2	25	19	30
Alyceclover	Common	3	302	3	35	30	36
Cowpea	Chinese Red	1	113	Harvested			
Cowpea	Chinese Red	2	208	Harvested			
Cowpea	Chinese Red	3	308	Harvested			
Cowpea	Iron & Clay	1	112	10	28	32	26
Cowpea	Iron & Clay	2	201	10	34	26	28
Cowpea	Iron & Clay	3	312	10	36	34	36
Cowpea	Red Ripper	1	111	Harvested			
Cowpea	Red Ripper	2	202	Harvested			
Cowpea	Red Ripper	3	313	Harvested			

Species	Cultivar	Rep	Plot	Canopy ¹	80 DAP		
					Height 1	Height 2	Height 3
					-----in-----		
Forage Soybean	Laredo	1	108	Harvested			
Forage Soybean	Laredo	2	216	Harvested			
Forage Soybean	Laredo	3	310	Harvested			
Forage Soybean	Large Lad	1	107	Harvested			
Forage Soybean	Large Lad	2	210	Harvested			
Forage Soybean	Large Lad	3	306	Harvested			
Lablab	Rongai	1	116	10	30	30	36
Lablab	Rongai	2	209	10	36	29	32
Lablab	Rongai	3	305	10	33	36	30
Partridge Pea	Comanche	1	115	6	36	40	28
Partridge Pea	Comanche	2	204	2	34	28	26
Partridge Pea	Comanche	3	315	9	40	38	40
Partridge Pea	Lark	1	114	0	-----	-----	-----
Partridge Pea	Lark	2	212	0	-----	-----	-----
Partridge Pea	Lark	3	311	0	-----	-----	-----
Pigeonpea	Georgia Two	1	105	Harvested			
Pigeonpea	Georgia Two	2	215	6	36	48	42
Pigeonpea	Georgia Two	3	314	Harvested			
Red "Mini" Hemp	Common	1	104	6	66	54	68
Red "Mini" Hemp	Common	2	205	4	48	46	36
Red "Mini" Hemp	Common	3	303	7	66	58	62
Sesbania	Common	1	109	Harvested			
Sesbania	Common	2	214	Harvested			
Sesbania	Common	3	304	Harvested			
Sunn Hemp	AU Golden	1	101	Harvested			
Sunn Hemp	AU Golden	2	213	Harvested			
Sunn Hemp	AU Golden	3	309	Harvested			
Sunn Hemp	Common	1	102	Harvested			
Sunn Hemp	Common	2	206	Harvested			
Sunn Hemp	Common	3	301	Harvested			
Sunn Hemp	Tropic Sun	1	103	Harvested			
Sunn Hemp	Tropic Sun	2	211	Harvested			
Sunn Hemp	Tropic Sun	3	316	Harvested			
Velvet Bean	Common	1	110	10	28	32	26
Velvet Bean	Common	2	207	5	26	30	24
Velvet Bean	Common	3	307	6	29	30	26
					100 DAP		
Alyceclover	Common	1	106	4	25	50	47
Alyceclover	Common	2	203	3	29	47	24
Alyceclover	Common	3	302	3	36	36	28
Cowpea	Chinese Red	1	113	Harvested			
Cowpea	Chinese Red	2	208	Harvested			
Cowpea	Chinese Red	3	308	Harvested			
Cowpea	Iron & Clay	1	112	10	20	24	28
Cowpea	Iron & Clay	2	201	10	28	22	25

Species	Cultivar	Rep	Plot	Canopy ¹	100 DAP		
					Height 1	Height 2	Height 3
					-----in-----		
Cowpea	Iron & Clay	3	312	10	32	28	24
Cowpea	Red Ripper	1	111	Harvested			
Cowpea	Red Ripper	2	202	Harvested			
Cowpea	Red Ripper	3	313	Harvested			
Forage Soybean	Laredo	1	108	Harvested			
Forage Soybean	Laredo	2	216	Harvested			
Forage Soybean	Laredo	3	310	Harvested			
Forage Soybean	Large Lad	1	107	Harvested			
Forage Soybean	Large Lad	2	210	Harvested			
Forage Soybean	Large Lad	3	306	Harvested			
Lablab	Rongai	1	116	10	25	35	28
Lablab	Rongai	2	209	10	28	26	24
Lablab	Rongai	3	305	10	32	20	26
Partridge Pea	Comanche	1	115	5	29	32	30
Partridge Pea	Comanche	2	204	3	35	28	30
Partridge Pea	Comanche	3	315	8	36	28	34
Partridge Pea	Lark	1	114	0	-----	-----	-----
Partridge Pea	Lark	2	212	0	-----	-----	-----
Partridge Pea	Lark	3	311	0	-----	-----	-----
Pigeonpea	Georgia Two	1	105	Harvested			
Pigeonpea	Georgia Two	2	215	9	40	56	47
Pigeonpea	Georgia Two	3	314	Harvested			
Red "Mini" Hemp	Common	1	104	8	82	65	70
Red "Mini" Hemp	Common	2	205	9	48	60	46
Red "Mini" Hemp	Common	3	303	7	56	54	96
Sesbania	Common	1	109	Harvested			
Sesbania	Common	2	214	Harvested			
Sesbania	Common	3	304	Harvested			
Sunn Hemp	AU Golden	1	101	Harvested			
Sunn Hemp	AU Golden	2	213	Harvested			
Sunn Hemp	AU Golden	3	309	Harvested			
Sunn Hemp	Common	1	102	Harvested			
Sunn Hemp	Common	2	206	Harvested			
Sunn Hemp	Common	3	301	Harvested			
Sunn Hemp	Tropic Sun	1	103	Harvested			
Sunn Hemp	Tropic Sun	2	211	Harvested			
Sunn Hemp	Tropic Sun	3	316	Harvested			
Velvet Bean	Common	1	110	10	30	29	32
Velvet Bean	Common	2	207	10	48	36	32
Velvet Bean	Common	3	307	9	28	26	24

¹ Canopy scale 0-10 where 0 = less than 10%; 1 = 10%; 2 = 20% 3 = 30%; 4 = 40%, 5 = 50%; 6 = 60%; 7 = 70%; 8 = 80%; 9 = 90%; and 10 = 100% cover.

Table 18. Flowering percentage at 40, 50, 60, 70, 80, and 100 days after planting (DAP) for warm-season legume cover crop plots planted 21 June 2017 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	40	50	60	70	80	100
				DAP	DAP	DAP	DAP	DAP	DAP
				-----%-----					
Alyceclover	Common	1	106	0	0	0	0	0	90
Alyceclover	Common	2	203	0	0	0	0	0	100
Alyceclover	Common	3	302	0	0	0	0	0	100
Cowpea	Chinese Red	1	113	0	10	60	H ¹		
Cowpea	Chinese Red	2	208	0	20	80	H		
Cowpea	Chinese Red	3	308	40	60	100	H		
Cowpea	Iron & Clay	1	112	0	0	0	0	0	100
Cowpea	Iron & Clay	2	201	0	0	Bud	0	0	100
Cowpea	Iron & Clay	3	312	0	0	0	0	0	100
Cowpea	Red Ripper	1	111	0	0	70	H		
Cowpea	Red Ripper	2	202	0	0	100	H		
Cowpea	Red Ripper	3	313	0	Bud	50	H		
Forage Soybean	Laredo	1	108	0	30	90	H		
Forage Soybean	Laredo	2	216	0	2	85	H		
Forage Soybean	Laredo	3	310	0	0	50	H		
Forage Soybean	Large Lad	1	107	0	0	80	H		
Forage Soybean	Large Lad	2	210	0	0	80	H		
Forage Soybean	Large Lad	3	306	0	0	90	H		
Lablab	Rongai	1	116	0	0	0	0	0	0
Lablab	Rongai	2	209	0	0	0	0	0	0
Lablab	Rongai	3	305	0	0	0	0	0	0
Partridge Pea	Comanche	1	115	0	0	10	30	10	50
Partridge Pea	Comanche	2	204	0	0	0	10	0	0
Partridge Pea	Comanche	3	315	0	0	10	40	0	0
Partridge Pea	Lark	1	114	0	-----	-----	-----	-----	-----
Partridge Pea	Lark	2	212	0	0	-----	-----	-----	-----
Partridge Pea	Lark	3	311	0	-----	-----	-----	-----	-----
Pigeonpea	Georgia Two	1	105	0	0	Bud	10	H	
Pigeonpea	Georgia Two	2	215	0	0	Bud	5	H	
Pigeonpea	Georgia Two	3	314	0	0	Bud	10	H	
Red "Mini" Hemp	Common	1	104	0	0	0	0	0	10
Red "Mini" Hemp	Common	2	205	0	0	Bud	0	0	0
Red "Mini" Hemp	Common	3	303	0	0	Bud	0	0	Bud
Sesbania	Common	1	109	0	20	90	H		
Sesbania	Common	2	214	0	10	95	H		
Sesbania	Common	3	304	0	5	70	H		
Sunn Hemp	AU Golden	1	101	Bud	30	100	H		
Sunn Hemp	AU Golden	2	213	Bud	20	100	H		
Sunn Hemp	AU Golden	3	309	30	30	100	H		
Sunn Hemp	Common	1	102	0	0	Bud	20	H	
Sunn Hemp	Common	2	206	0	Bud	10	40	H	
Sunn Hemp	Common	3	301	0	Bud	10	30	H	
Sunn Hemp	Tropic Sun	1	103	0	Bud	10	20	H	
Sunn Hemp	Tropic Sun	2	211	0	Bud	10	30	H	

Species	Cultivar	Rep	Plot	40 DAP	50 DAP	60 DAP	70 DAP	80 DAP	100 DAP	
				-----%-----						
Sunn Hemp	Tropic Sun	3	316	0	Bud	Bud	20	H		
Velvet Bean	Common	1	110	0	0	0	0	0	0	
Velvet Bean	Common	2	207	0	0	0	0	0	0	
Velvet Bean	Common	3	307	0	0	0	0	0	0	

¹H=harvested

Table 19. Plant height measured at harvest and dry matter (DM) yield of biomass harvested from warm-season legume cover crop plots planted 21 June 2017 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	Date	Height 1	Height 2	Height 3	DM Yield ¹
					-----in-----			lb/ac
Alyceclover	Common	1	106	9/28/2017	25	50	47	3488
Alyceclover	Common	2	203	9/28/2017	29	47	24	1595
Alyceclover	Common	3	302	9/28/2017	36	36	28	2913
Cowpea	Chinese Red	1	113	8/16/2017	36	41	33	6610
Cowpea	Chinese Red	2	208	8/16/2017	38	36	42	3714
Cowpea	Chinese Red	3	308	8/16/2017	36	48	38	5189
Cowpea	Iron & Clay	1	112	9/28/2017	20	24	28	9665
Cowpea	Iron & Clay	2	201	9/28/2017	28	22	25	8145
Cowpea	Iron & Clay	3	312	9/28/2017	32	28	24	7404
Cowpea	Red Ripper	1	111	8/16/2017	23	19	25	6069
Cowpea	Red Ripper	2	202	8/16/2017	18	18	20	5657
Cowpea	Red Ripper	3	313	8/16/2017	32	24	28	4313
Forage Soybean	Laredo	1	108	8/16/2017	18	25	25	622
Forage Soybean	Laredo	2	216	8/16/2017	10	13	15	717
Forage Soybean	Laredo	3	310	8/16/2017	12	16	18	745
Forage Soybean	Large Lad	1	107	8/16/2017	20	25	31	520
Forage Soybean	Large Lad	2	210	8/16/2017	13	12	10	592
Forage Soybean	Large Lad	3	306	8/16/2017	12	13	16	986
Lablab ²	Rongai	1	116	9/28/2017	25	35	28	6649
Lablab	Rongai	2	209	9/28/2017	28	26	24	7014
Lablab	Rongai	3	305	9/28/2017	32	20	26	5443
Partridge Pea	Comanche	1	115	9/28/2017	29	32	30	2180
Partridge Pea	Comanche	2	204	9/28/2017	35	28	30	944
Partridge Pea	Comanche	3	315	9/28/2017	36	28	34	4896
Partridge Pea	Lark	1	114	- ³	-	-	-	-
Partridge Pea	Lark	2	212	-	-	-	-	-
Partridge Pea	Lark	3	311	-	-	-	-	-
Pigeonpea	Georgia Two	1	105	9/5/2017	42	36	38	2290
Pigeonpea	Georgia Two	2	215	9/28/2017	40	56	47	4300
Pigeonpea	Georgia Two	3	314	9/5/2017	36	46	38	4688
Red "Mini" Hemp	Common	1	104	9/28/2017	82	65	70	12518
Red "Mini" Hemp	Common	2	205	9/28/2017	48	60	46	4489
Red "Mini" Hemp	Common	3	303	9/28/2017	56	54	96	8876
Sesbania	Common	1	109	8/16/2017	32	38	42	1193

Species	Cultivar	Rep	Plot	Date	Height	Height	Height	DM Yield ¹
					1	2	3	
					-----in-----			lb/ac
Sesbania	Common	2	214	8/16/2017	36	42	56	940
Sesbania	Common	3	304	8/16/2017	37	39	27	800
Sunn Hemp	AU Golden	1	101	8/16/2017	65	72	56	12022
Sunn Hemp	AU Golden	2	213	8/16/2017	72	82	62	13757
Sunn Hemp	AU Golden	3	309	8/16/2017	72	82	75	11090
Sunn Hemp	Common	1	102	9/5/2017	108	96	101	25795
Sunn Hemp	Common	2	206	9/5/2017	46	56	58	10140
Sunn Hemp	Common	3	301	9/7/2017	101	108	96	29335
Sunn Hemp	Tropic Sun	1	103	9/5/2017	108	108	101	14266
Sunn Hemp	Tropic Sun	2	211	9/5/2017	56	58	56	16121
Sunn Hemp	Tropic Sun	3	316	9/5/2017	108	102	96	32900
Velvet Bean ²	Common	1	110	9/28/2017	30	29	32	7068
Velvet Bean	Common	2	207	9/28/2017	48	36	32	2732
Velvet Bean	Common	3	307	9/28/2017	28	26	24	3493

¹ A 5.4 ft² (0.5 m²) area in the center of each 4' x 20' plot was harvested to determine yield. Plots were harvested when plants were in the 50% flower to early pod stage.

² Lablab and velvet bean plants were harvested in the vegetative stage because flower buds had not formed by the end of the study period.

Table 20. Carbon and nitrogen content determined by tissue analysis of plant material harvested from warm-season legume cover crop plots planted 21 June 2017 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	Total C	Total N
				-----%-----	
Alyceclover	Common	1	106	46.27	2.21
Alyceclover	Common	2	203	39.41	2.21
Alyceclover	Common	3	302	46.11	1.79
Cowpea	Chinese Red	1	113	43.54	2.42
Cowpea	Chinese Red	2	208	44.25	2.35
Cowpea	Chinese Red	3	308	43.72	2.44
Cowpea	Iron & Clay	1	112	44.17	2.51
Cowpea	Iron & Clay	2	201	39.21	2.55
Cowpea	Iron & Clay	3	312	44.21	2.22
Cowpea	Red Ripper	1	111	44.08	3.65
Cowpea	Red Ripper	2	202	54.94	2.44
Cowpea	Red Ripper	3	313	43.45	2.67
Forage Soybean	Laredo	1	108	-----	-----
Forage Soybean	Laredo	2	216	43.48	2.90
Forage Soybean	Laredo	3	310	44.92	3.03
Forage Soybean	Large Lad	1	107	44.24	3.10
Forage Soybean	Large Lad	2	210	42.74	2.22
Forage Soybean	Large Lad	3	306	43.45	2.13
Lablab	Rongai	1	116	44.96	2.44
Lablab	Rongai	2	209	44.46	1.93
Lablab	Rongai	3	305	44.90	2.68
Partridge Pea	Comanche	1	115	47.46	2.25

Species	Cultivar	Rep	Plot	Total C	Total N
				-----%-----	
Partridge Pea	Comanche	2	204	-----	-----
Partridge Pea	Comanche	3	315	46.74	1.98
Partridge Pea	Lark	1	114	-----	-----
Partridge Pea	Lark	2	212	-----	-----
Partridge Pea	Lark	3	311	-----	-----
Pigeonpea	Georgia Two	1	105	48.58	3.29
Pigeonpea	Georgia Two	2	215	48.10	2.38
Pigeonpea	Georgia Two	3	314	49.48	3.23
Red "Mini" Hemp	Common	1	104	46.03	3.25
Red "Mini" Hemp	Common	2	205	47.56	2.09
Red "Mini" Hemp	Common	3	303	46.15	2.68
Sesbania	Common	1	109	-----	-----
Sesbania	Common	2	214	43.58	1.14
Sesbania	Common	3	304	44.21	2.07
Sunn Hemp	AU Golden	1	101	44.90	2.67
Sunn Hemp	AU Golden	2	213	45.63	2.17
Sunn Hemp	AU Golden	3	309	45.12	3.08
Sunn Hemp	Common	1	102	44.97	2.39
Sunn Hemp	Common	2	206	47.80	2.82
Sunn Hemp	Common	3	301	45.40	2.18
Sunn Hemp	Tropic Sun	1	103	45.86	2.13
Sunn Hemp	Tropic Sun	2	211	45.40	2.28
Sunn Hemp	Tropic Sun	3	316	45.79	2.21
Velvet Bean	Common	1	110	45.88	2.77
Velvet Bean	Common	2	207	46.49	2.94
Velvet Bean	Common	3	307	46.89	3.00

2018 Data

Table 21. Emergence ratings at 7 and 14 days after planting (DAP) for warm-season legume cover crop plots planted 26 June 2018 at the Brooksville Plant Materials Center

Species	Cultivar	Rep	Plot	7 DAP	14 DAP	Notes
Cowpea	Chinese Red	1	101	1 ¹	1	Plants stressed and stunted
Cowpea	Chinese Red	2	206	1	2	
Cowpea	Chinese Red	3	303	1	2	
Cowpea	Chinese Red	4	402	1	1	
Cowpea	Iron & Clay	1	102	1	1	Plants stressed and stunted
Cowpea	Iron & Clay	2	203	1	2	
Cowpea	Iron & Clay	3	304	1	3	
Cowpea	Iron & Clay	4	403	1	1	
Cowpea	Red Ripper	1	103	1	1	Plants stressed and stunted
Cowpea	Red Ripper	2	202	2	2	
Cowpea	Red Ripper	3	307	1	1	
Cowpea	Red Ripper	4	405	1	2	
Forage Soybean	Laredo	1	104	0	1	
Forage Soybean	Laredo	2	208	0	0	
Forage Soybean	Laredo	3	302	0	0	
Forage Soybean	Laredo	4	407	0	1	
Forage Soybean	Large Lad	1	105	0	0	
Forage Soybean	Large Lad	2	201	0	0	
Forage Soybean	Large Lad	3	308	0	0	
Forage Soybean	Large Lad	4	401	0	0	
Lablab	Rongai	1	108	1	2	
Lablab	Rongai	2	204	1	2	
Lablab	Rongai	3	305	1	2	
Lablab	Rongai	4	406	2	3	
Sunn Hemp	Common	1	106	1	2	
Sunn Hemp	Common	2	207	2	2	
Sunn Hemp	Common	3	306	1	2	
Sunn Hemp	Common	4	404	1	2	
Sunn Hemp	Tropic Sun	1	107	1	1	
Sunn Hemp	Tropic Sun	2	205	1	2	
Sunn Hemp	Tropic Sun	3	301	1	1	
Sunn Hemp	Tropic Sun	4	408	1	2	

¹ Rating Scale - 0 = Poor (<25%); 1 = Moderate (30-60%); 2 = Good (65-85%); 3 = Excellent (90-100%).

Table 22. Canopy ratings and plant height measurements at 10, 20, and 30 days after planting (DAP) for warm-season legume cover crop plots planted 26 June 2018 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	10 DAP			
				Canopy ¹	Height 1	Height 2	Height 3
					-----in-----		
Cowpea	Chinese Red	1	101	1	3	2	2
Cowpea	Chinese Red	2	206	1	4	3	3

Cowpea	Chinese Red	3	303	1	3	4	3
					10 DAP		
Species	Cultivar	Rep	Plot	Canopy¹	Height 1	Height 2	Height 3
					-----in-----		
Cowpea	Chinese Red	4	402	1	3	3	3
Cowpea	Iron & Clay	1	102	2	2	3	3
Cowpea	Iron & Clay	2	203	1	2	3	3
Cowpea	Iron & Clay	3	304	2	5	4	4
Cowpea	Iron & Clay	4	403	2	3	4	4
Cowpea	Red Ripper	1	103	2	3	2	2
Cowpea	Red Ripper	2	202	2	4	3	3
Cowpea	Red Ripper	3	307	1	5	4	4
Cowpea	Red Ripper	4	405	2	3	4	3
Forage Soybean	Laredo	1	104	1	1	2	1
Forage Soybean	Laredo	2	208	1	3	1	2
Forage Soybean	Laredo	3	302	1	3	2	2
Forage Soybean	Laredo	4	407	1	2	3	2
Forage Soybean	Large Lad	1	105	1	- ²	-	-
Forage Soybean	Large Lad	2	201	1	-	-	-
Forage Soybean	Large Lad	3	308	1	-	-	-
Forage Soybean	Large Lad	4	401	1	2	1	1
Lablab	Rongai	1	108	2	2	3	4
Lablab	Rongai	2	204	2	3	2	3
Lablab	Rongai	3	305	2	3	3	3
Lablab	Rongai	4	406	2	3	3	3
Sunn Hemp	Common	1	106	2	3	3	4
Sunn Hemp	Common	2	207	2	5	5	4
Sunn Hemp	Common	3	306	1	5	5	3
Sunn Hemp	Common	4	404	1	4	4	3
Sunn Hemp	Tropic Sun	1	107	1	3	2	3
Sunn Hemp	Tropic Sun	2	205	1	3	5	3
Sunn Hemp	Tropic Sun	3	301	1	3	4	4
Sunn Hemp	Tropic Sun	4	408	1	4	5	4
					20 DAP		
Cowpea	Chinese Red	1	101	2	7	7	6
Cowpea	Chinese Red	2	206	3	9	10	10
Cowpea	Chinese Red	3	303	3	11	11	10
Cowpea	Chinese Red	4	402	3	13	12	9
Cowpea	Iron & Clay	1	102	3	9	8	9
Cowpea	Iron & Clay	2	203	3	11	10	11
Cowpea	Iron & Clay	3	304	4	14	12	13
Cowpea	Iron & Clay	4	403	3	11	15	13
Cowpea	Red Ripper	1	103	2	8	7	6
Cowpea	Red Ripper	2	202	4	7	10	8
Cowpea	Red Ripper	3	307	3	12	11	13
Cowpea	Red Ripper	4	405	4	11	11	12
Forage Soybean	Laredo	1	104	1	4	5	3
Forage Soybean	Laredo	2	208	1	6	7	5

Species	Cultivar	Rep	Plot	Canopy	20 DAP		
					Height 1	Height 2	Height 3
					-----in-----		
Forage Soybean	Laredo	3	302	1	5	5	6
Forage Soybean	Laredo	4	407	2	6	6	6
Forage Soybean	Large Lad	1	105	1	-	-	-
Forage Soybean	Large Lad	2	201	1	-	-	-
Forage Soybean	Large Lad	3	308	1	5	4	5
Forage Soybean	Large Lad	4	401	1	5	4	5
Lablab	Rongai	1	108	4	6	7	7
Lablab	Rongai	2	204	3	10	9	8
Lablab	Rongai	3	305	3	5	8	7
Lablab	Rongai	4	406	4	9	9	9
Sunn Hemp	Common	1	106	4	10	11	9
Sunn Hemp	Common	2	207	4	14	15	19
Sunn Hemp	Common	3	306	3	19	16	17
Sunn Hemp	Common	4	404	4	19	15	12
Sunn Hemp	Tropic Sun	1	107	3	8	10	10
Sunn Hemp	Tropic Sun	2	205	3	12	12	10
Sunn Hemp	Tropic Sun	3	301	3	16	13	17
Sunn Hemp	Tropic Sun	4	408	3	11	12	13
					30 DAP		
Cowpea	Chinese Red	1	101	4	16	15	13
Cowpea	Chinese Red	2	206	4	18	18	23
Cowpea	Chinese Red	3	303	4	21	22	20
Cowpea	Chinese Red	4	402	4	19	17	17
Cowpea	Iron & Clay	1	102	4	15	16	17
Cowpea	Iron & Clay	2	203	4	18	17	21
Cowpea	Iron & Clay	3	304	5	23	24	22
Cowpea	Iron & Clay	4	403	4	20	28	22
Cowpea	Red Ripper	1	103	3	15	15	16
Cowpea	Red Ripper	2	202	5	18	16	14
Cowpea	Red Ripper	3	307	4	20	20	27
Cowpea	Red Ripper	4	405	5	20	19	16
Forage Soybean	Laredo	1	104	2	10	10	7
Forage Soybean	Laredo	2	208	1	10	9	6
Forage Soybean	Laredo	3	302	2	9	11	13
Forage Soybean	Laredo	4	407	2	11	9	12
Forage Soybean	Large Lad	1	105	1	-	-	-
Forage Soybean	Large Lad	2	201	1	-	-	-
Forage Soybean	Large Lad	3	308	1	8	7	9
Forage Soybean	Large Lad	4	401	1	10	7	7
Lablab	Rongai	1	108	4	12	13	10
Lablab	Rongai	2	204	5	16	17	15
Lablab	Rongai	3	305	4	17	20	21
Lablab	Rongai	4	406	5	21	27	25
Sunn Hemp	Common	1	106	3	22	23	17
Sunn Hemp	Common	2	207	4	33	40	41

Sunn Hemp	Common	3	306	3	38	33	35
Sunn Hemp	Common	4	404	3	36	42	31
Sunn Hemp	Tropic Sun	1	107	3	18	25	28
Sunn Hemp	Tropic Sun	2	205	3	30	24	33
Sunn Hemp	Tropic Sun	3	301	3	36	32	39
Sunn Hemp	Tropic Sun	4	408	3	32	36	38

¹ Canopy rating scale 1-5 where 1 = 0 -15%; 2 = 20-35%; 3 = 40-60%; 4 = 65-80%; 5 = 85-100%.

²No data because no plants emerged.

Table 23. Insect and disease damage ratings for warm-season legume cover crop plots planted 26 June 2018 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	Date 1 ¹		Date 2 ¹	
				Insect ²	Disease ²	Insect	Disease
Cowpea	Chinese Red	1	101	1	0	0	3
Cowpea	Chinese Red	2	206	1	0	0	1
Cowpea	Chinese Red	3	303	1	0	0	2
Cowpea	Chinese Red	4	402	1	0	0	1
Cowpea	Iron & Clay	1	102	1	1	1	3
Cowpea	Iron & Clay	2	203	1	0	0	0
Cowpea	Iron & Clay	3	304	1	0	0	1
Cowpea	Iron & Clay	4	403	0	0	0	1
Cowpea	Red Ripper	1	103	1	1	1	3
Cowpea	Red Ripper	2	202	1	0	0	0
Cowpea	Red Ripper	3	307	1	0	0	1
Cowpea	Red Ripper	4	405	1	0	0	1
Forage Soybean	Laredo	1	104	1	0	0	1
Forage Soybean	Laredo	1	208	1	0	0	2
Forage Soybean	Laredo	3	302	1	0	0	1
Forage Soybean	Laredo	4	407	1	0	0	0
Forage Soybean	Large Lad	1	105	- ³	-	-	-
Forage Soybean	Large Lad	2	201	-	-	-	-
Forage Soybean	Large Lad	3	308	1	0	0	0
Forage Soybean	Large Lad	4	401	1	0	0	1
Lablab	Rongai	1	108	1	0	0	2
Lablab	Rongai	2	204	1	0	0	2
Lablab	Rongai	3	305	1	0	0	2
Lablab	Rongai	4	406	1	0	0	3
Sunn Hemp	Common	1	106	1	1	1	2
Sunn Hemp	Common	2	207	1	0	0	1
Sunn Hemp	Common	3	306	1	0	0	1
Sunn Hemp	Common	4	404	1	0	0	1
Sunn Hemp	Tropic Sun	1	107	1	0	0	1
Sunn Hemp	Tropic Sun	2	205	1	0	0	1
Sunn Hemp	Tropic Sun	3	301	1	0	0	2
Sunn Hemp	Tropic Sun	4	408	1	0	0	1

¹Date 1 – 23 Jun 2018; Date 2 –rated at harvest of individual legumes. See Table 25 for dates.

² Insect and disease rating scale 0-5 where 0=none, 1=1-15%, 2=20-35%, 3=40-60%, 5=85-100%

³No data because no germination.

Table 24. Flowering dates and observations for warm-season legume cover crop plots planted 26 June 2018 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	Date	Notes
Cowpea	Chinese Red	1	101	8/8/2018	
Cowpea	Chinese Red	2	206	8/8/2018	
Cowpea	Chinese Red	3	303	8/8/2018	
Cowpea	Chinese Red	4	402	8/8/2018	
Cowpea	Iron & Clay	1	102	9/21/2018	
Cowpea	Iron & Clay	2	203	9/21/2018	
Cowpea	Iron & Clay	3	304	9/17/2018	
Cowpea	Iron & Clay	4	403	9/21/2018	
Cowpea	Red Ripper	1	103	9/11/2018	started previous week
Cowpea	Red Ripper	2	202	8/13/2018	buds + some pods
Cowpea	Red Ripper	3	307	8/13/2018	flowers, aborted buds, pods
Cowpea	Red Ripper	4	405	8/13/2018	
Forage Soybean	Laredo	1	104	8/8/2018	
Forage Soybean	Laredo	2	208	8/8/2018	
Forage Soybean	Laredo	3	302	8/8/2018	
Forage Soybean	Laredo	4	407	8/8/2018	
Forage Soybean	Large Lad	1	105	-	No germination
Forage Soybean	Large Lad	2	201	-	No germination
Forage Soybean	Large Lad	3	308	8/13/2018	
Forage Soybean	Large Lad	4	401	8/13/2018	
Lablab	Rongai	1	108	no bloom	
Lablab	Rongai	2	204	no bloom	
Lablab	Rongai	3	305	no bloom	
Lablab	Rongai	4	406	no bloom	
Sunn Hemp	Common	1	106	9/17/2018	
Sunn Hemp	Common	2	207	9/17/2018	
Sunn Hemp	Common	3	306	9/21/2018	
Sunn Hemp	Common	4	404	9/14/2018	
Sunn Hemp	Tropic Sun	1	107	9/21/2018	
Sunn Hemp	Tropic Sun	2	205	9/21/2018	
Sunn Hemp	Tropic Sun	3	301	9/21/2018	
Sunn Hemp	Tropic Sun	4	408	9/21/2018	

Table 25. Plant height measured at harvest and dry matter (DM) yield of biomass harvested from warm-season legume cover crop plots planted 26 June 2018 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	Date	Height 1	Height 2	Height 3	DM Yield ¹
					-----in-----			lb/ac
Cowpea	Chinese Red	1	101	8/14/2018	36	42	44	4103
Cowpea	Chinese Red	2	206	8/14/2018	45	41	50	7549
Cowpea	Chinese Red	3	303	8/14/2018	37	42	42	7064
Cowpea	Chinese Red	4	402	8/14/2018	50	39	50	4538
Cowpea	Iron and Clay	1	102	9/26/2018	44	35	32	5820

Species	Cultivar	Rep	Plot	Date	Height 1	Height 2	Height 3	DM Yield ¹
					-----in-----			lb/ac
Cowpea	Iron and Clay	2	203	9/26/2018	32	23	30	19402
Cowpea	Iron and Clay	3	304	9/26/2018	23	24	26	14468
Cowpea	Iron and Clay	4	403	9/26/2018	23	29	26	17892
Cowpea	Red Ripper	1	103	9/21/2018	22	21	16	5698
Cowpea	Red Ripper	2	202	8/20/2018	34	37	31	8030
Cowpea	Red Ripper	3	307	8/20/2018	29	37	36	6301
Cowpea	Red Ripper	4	405	8/20/2018	32	36	37	11649
Forage Soybean	Laredo	1	104	8/14/2018	18	29	13	392
Forage Soybean	Laredo	1	208	8/14/2018	17	23	18	326
Forage Soybean	Laredo	3	302	8/14/2018	25	26	21	1044
Forage Soybean	Laredo	4	407	8/14/2018	25	25	22	809
Forage Soybean	Large Lad	1	105	⁻³	-	-	-	-
Forage Soybean	Large Lad	2	201	-	-	-	-	-
Forage Soybean	Large Lad	3	308	-	-	-	-	-
Forage Soybean	Large Lad	4	401	-	-	-	-	-
Lablab ²	Rongai	1	108	9/26/2018	26	28	22	5219
Lablab	Rongai	2	204	9/26/2018	39	36	26	9191
Lablab	Rongai	3	305	9/26/2018	23	26	23	9329
Lablab	Rongai	4	406	9/26/2018	32	25	29	9784
Sunn Hemp	Common	1	106	9/26/2018	78	82	97	13092
Sunn Hemp	Common	2	207	9/26/2018	84	90	91	23033
Sunn Hemp	Common	3	306	9/26/2018	87	96	84	22364
Sunn Hemp	Common	4	404	9/26/2018	99	96	94	24494
Sunn Hemp	Tropic Sun	1	107	9/26/2018	97	93	81	12673
Sunn Hemp	Tropic Sun	2	205	9/26/2018	109	97	109	22919
Sunn Hemp	Tropic Sun	3	301	9/26/2018	86	86	97	18736
Sunn Hemp	Tropic Sun	4	408	9/26/2018	94	97	92	21083

¹ A 5.4 ft² (0.5 m²) area in the center of each 3.5 x 20 ft plot was harvested to determine yield.

² Lablab plants were harvested in the vegetative stage because flower buds had not formed by the end of the study period.

³No harvestable material.

Table 26. Carbon and nitrogen content determined by tissue analysis of plant material harvested from warm-season legume cover crop plots planted 26 June 2018 at the Brooksville Plant Materials Center.

Species	Cultivar	Rep	Plot	Total C	Total N
				-----%-----	
Cowpea	Chinese Red	1	101	43.85	2.15
Cowpea	Chinese Red	2	206	44.66	2.66
Cowpea	Chinese Red	3	303	44.85	2.63
Cowpea	Chinese Red	4	402	44.80	2.14
Cowpea	Iron & Clay	1	102	43.85	1.88
Cowpea	Iron & Clay	2	203	44.48	2.37
Cowpea	Iron & Clay	3	304	44.82	2.51
Cowpea	Iron & Clay	4	403	44.66	2.24
Cowpea	Red Ripper	1	103	44.38	2.23

Species	Cultivar	Rep	Plot	Total C	Total N
				-----%-----	
Cowpea	Red Ripper	2	202	44.34	2.40
Cowpea	Red Ripper	3	307	44.85	3.00
Cowpea	Red Ripper	4	405	43.48	2.42
Forage Soybean	Laredo	1	104	- ¹	-
Forage Soybean	Laredo	2	208	-	-
Forage Soybean	Laredo	3	302	44.80	2.38
Forage Soybean	Laredo	4	407	-	-
Forage Soybean	Large Lad	1	105	-	-
Forage Soybean	Large Lad	2	201	-	-
Forage Soybean	Large Lad	3	308	-	-
Forage Soybean	Large Lad	4	401	-	-
Lablab	Rongai	1	108	44.62	2.08
Lablab	Rongai	2	204	45.34	2.69
Lablab	Rongai	3	305	44.46	2.20
Lablab	Rongai	4	406	44.76	2.67
Sunn Hemp	Common	1	106	44.81	2.05
Sunn Hemp	Common	2	207	45.88	2.47
Sunn Hemp	Common	3	306	43.77	2.04
Sunn Hemp	Common	4	404	45.89	2.12
Sunn Hemp	Tropic Sun	1	107	45.04	1.91
Sunn Hemp	Tropic Sun	2	205	45.51	1.93
Sunn Hemp	Tropic Sun	3	301	44.89	2.14
Sunn Hemp	Tropic Sun	4	408	46.07	2.32

¹Not enough material for analysis.

Performance of Warm Season Legume Cover Crops in Florida. Janet Grabowski and M.J. Williams. 2020. FLPMC. Brooksville, FL. March 2020. 46pp.

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