

Revised assessment date 1 Dec 2017

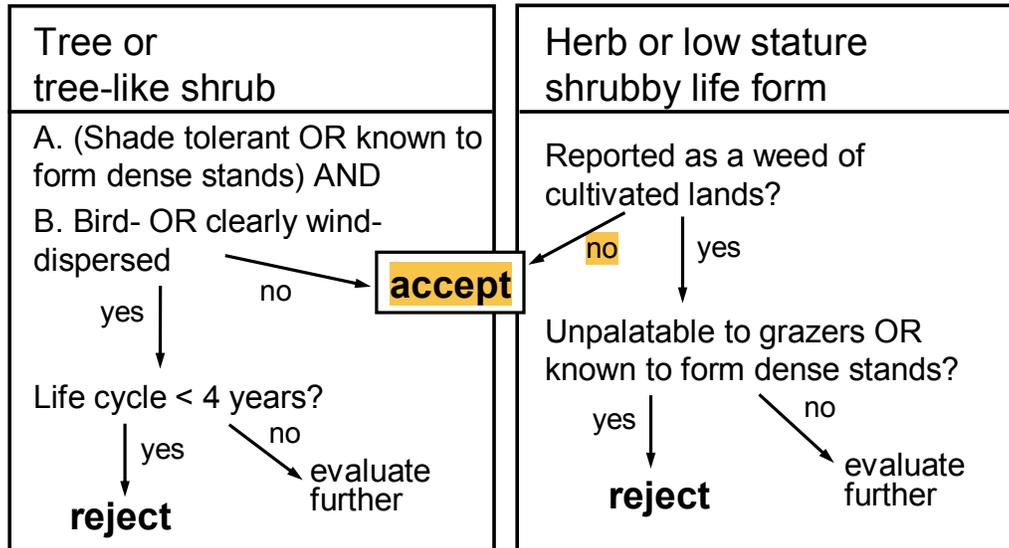
<i>Crotalaria juncea</i> (Indian-Hemp, Madras-Hemp, Sann-Hemp, Sunn <i>Crotalaria</i>, Sunn-Hemp) ALL ZONES		Answer	Score
1.01	Is the species highly domesticated?	n	0
1.02	Has the species become naturalised where grown?		
1.03	Does the species have weedy races?		
2.01	Species suited to Florida's USDA climate zones (0-low; 1-intermediate; 2-high) North Zone: suited to Zones 8, 9 Central Zone: suited to Zones 9, 10 South Zone: suited to Zone 10	2	
2.02	Quality of climate match data (0-low; 1-intermediate; 2-high)	2	
2.03	Broad climate suitability (environmental versatility)	y	1
2.04	Native or naturalized in habitats with periodic inundation North Zone: mean annual precipitation 50-70 inches Central Zone: mean annual precipitation 40-60 inches South Zone: mean annual precipitation 40-60 inches	y	1
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	y	2
3.02	Garden/amenity/disturbance weed	y	2
3.03	Weed of agriculture	n	0
3.04	Environmental weed	n	0
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	unk	0
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals	?	
4.05	Toxic to animals	y	1
4.06	Host for recognised pests and pathogens	?	
4.07	Causes allergies or is otherwise toxic to humans	unk	0
4.08	Creates a fire hazard in natural ecosystems	unk	0
4.09	Is a shade tolerant plant at some stage of its life cycle	n	0
4.10	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils). North & Central Zones: infertile soils; South Zone: shallow limerock or Histisols.	y	1
4.11	Climbing or smothering growth habit	n	0
4.12	Forms dense thickets	y	1
5.01	Aquatic	n	0
5.02	Grass	n	0
5.03	Nitrogen fixing woody plant	n	0
5.04	Geophyte	n	0

6.01	Evidence of substantial reproductive failure in native habitat	n	0
6.02	Produces viable seed	y	1
6.03	Hybridizes naturally	unk	-1
6.04	Self-compatible or apomictic	y	1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	n	-1
6.07	Minimum generative time (years)	1	1
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n	-1
7.02	Propagules dispersed intentionally by people	y	1
7.03	Propagules likely to disperse as a produce contaminant	?	
7.04	Propagules adapted to wind dispersal	n	-1
7.05	Propagules water dispersed	unk	-1
7.06	Propagules bird dispersed	n	-1
7.07	Propagules dispersed by other animals (externally)	n	-1
7.08	Propagules dispersed by other animals (internally)	n	-1
8.01	Prolific seed production	n	-1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	?	
8.03	Well controlled by herbicides	y	-1
8.04	Tolerates, or benefits from, mutilation or cultivation	?	
8.05	Effective natural enemies present in U.S.	?	
Total Score		5	
Implemented Pacific Second Screening		Yes	
Risk Assessment Results		LOW	

section	# questions answered	satisfy minimum?
A		11 yes
B		7 yes
C		17 yes
total		35 yes

Pacific second screening: decision rules for species with WRA scores between 1 and 6

(from Daehler *et al.* 2004)



Vines must pass both tests

	Reference	Source data
1.01		Widely cultivated, but no evidence of selection for reduced weediness.
1.02		Skip to 2.01.
1.03		Skip to 2.01.
2.01	1. PERAL NAPPFAST Global Plant Hardiness (http://www.nappfast.org/Plant_hardiness/NAPPFAST%20Global%20zones/10-year%20climate/PLANT_HARDINESS_10YR%20lgnd.tif) & USDA Plant Hardiness Zone Map, 2012. Agricultural Research Service, U.S. Department of Agriculture. Accessed from http://planthardiness.ars.usda.gov . 2. USDA/ARS-GRIN [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/taxgenform.pl?language=en (02 July 2012).	No computer analysis was performed. 1. Global plant hardiness zones 10-13; equivalent to USDA Hardiness zones 9b-11b+ ([north?], central, & south zones of Florida). 2. Native distributional range: Bangladesh, Bhutan, India (throughout), exact native range in south Asia is obscure; Cultivated range: throughout the tropics.
2.02		No computer analysis was performed. Native range is well known; refer to 2.01 source data.
2.03	1. Köppen-Geiger climate map (http://www.hydrol-earth-syst-sci.net/11/1633/2007/hess-11-1633-2007.pdf).	1. Native distribution appears to be in at least three climatic groups (Am, Aw, Cwa, Cwb) and possibly one additional climatic group (BSh).
2.04	1. Maps of India. Annual Rainfall Map of India. http://www.mapsofindia.com/maps/india/annualrainfall.htm# . 2. Atlapedia Online. www.atlapedia.com . 3 July 2012.	1. 60 cm-800 cm (-1000 cm?) [23.6"-315" (-394"?)]. 2. Bhutan: 1,020 mm-1,520 mm (40"-60").
2.05	1. USDA/ARS-GRIN [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/taxgenform.pl?language=en (02 July 2012). 2. USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov , 2 July 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA. 3. GBIF (https://www.gbif.org/species/2942877 Accessed 12/1/2017)	1. Cultivated range is throughout the tropics. 2. Present in Florida, Hawaii, Puerto Rico, Virgin Islands. 3. see GBIF for global distribution map.
3.01	1. Pacific Island Ecosystems at Risk (PIER). Global Compendium of Weeds. http://www.hear.org . Accessed 25 June 2012. 2. Flora of China (http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=200012064 accessed 12/1/2017)	1. Naturalized in Japan, Australia (northern, New South Wales, western), United States, Madagascar, Swaziland. 2. It is widely naturalized in Africa, tropical and sub-tropical America, Asia, Australia, and Papua New Guinea.
3.02	1. Wells, M.J., et al. Catalogue of problem plants of southern Africa. Memoirs of the Botanical Survey of South Africa No. 53. Republic of South Africa; Botanical Research Institute, 1986. Print. 2.a-c. Joy, R. USDA NRCS. 2003. Sunn hemp: A cover crop for southern and tropical farming systems. Soil Quality – Agronomy Technical Note No. 10. Washington, DC.. http://plants.usda.gov/plantguide/pdf/pg_crju.pdf . 3. Maroyi, A., 2011. <i>Crotalaria juncea</i> L. [Internet] Record from Protabase. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. < http://database.prota.org/search.htm >. Accessed 6 July 2012.	1. Considered a ruderal and agrestal (general) weed in southern Africa 2.a. As of 2005, Arkansas considered the genus <i>Crotalaria</i> as a noxious weed. 2.b. May become weedy or invasive and displace desirable vegetation. 2.c. Does not perpetuate itself well and is not found in the wild (in Hawaii). 3. Often escapes from cultivation, naturalizes easily and grows in many areas as a ruderal plant.
3.03		No evidence.
3.04		No evidence.

3.05	<p>1. Wells, M.J., et al. Catalogue of problem plants of southern Africa. Memoirs of the Botanical Survey of South Africa No. 53. Republic of South Africa; Botanical Research Institute, 1986. Print. 2. Rod Randall's Weed List. From The Nature Conservancy's Wildland Invasive Species Team. Hosted by: Invasive.org. http://www.invasive.org/gist/biglist.html. Accessed 6 July 2012. 3. Virginia Tech Weed Identification Guide. Virginia Cooperative Extension. http://www.ppws.vt.edu/weedindex.htm. Accessed 9 July 2012.</p>	<p>1. <i>Crotalaria globifera</i> and <i>Crotalaria labutnifolia</i> (= <i>C. australis</i>) are considered weeds of ruderal, pastoral and possibly as weeds of health related and agrestal in southern Africa. 2. Australian naturalized and/or noxious taxa: <i>C. aculeata</i>, <i>C. agatiflora</i>, <i>C. alata</i>, <i>C. distans</i>, <i>C. goreensis</i>, <i>C. grahamiana</i>, <i>C. incana</i>, <i>C. laburnifolia</i>, <i>C. lanceolata</i>, <i>C. longirostrata</i>, <i>C. lunata</i>, <i>C. micans</i>, <i>C. ochroleuca</i>, <i>C. pallida</i>, <i>C. retusa</i>, <i>C. semperflorens</i>, <i>C. senegalensis</i>, <i>C. spectabilis</i>, <i>C. virgulata</i>, <i>C. zanzibarica</i>. 3. <i>C. spectabilis</i> is primarily a weed of agronomic crops.</p>
4.01		Species does not possess these morphological features.
4.02	<p>1. Skinner, Emillie M., et al. "Allelopathic effects of sunnhemp (<i>Crotalaria juncea</i> L.) on germination of vegetables and weeds." <i>HortScience</i> 47.1 (2012): 138-142.</p>	<p>1. Sun-Hemp is certainly phytotoxic. "In the greenhouse, ground dried sunnhemp residues (applied mixed with the soil at 1.6% w/w) reduced percent germination of lettuce (<i>Lactuca sativa</i> L.) and smooth pigweed (<i>Amaranthus hybridus</i> L.) to a similar degree as that caused by cereal rye (<i>Secale cereale</i> L. subsp. <i>cereale</i>) residues (applied at 1.5% w/w). The allelopathic activity of sunnhemp was greater in the leaves than in the roots or stems." But not enough evidence indicating allelopathy would occur in a natural setting (no evidence of non-concentrated effects).</p>
4.03	<p>1. USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov, 2 July 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA.</p>	<p>1. Family: Fabacea (not a parasitic family).</p>
4.04	<p>1.a-b. Mannetje, L.'t. FAO. <i>Crotalaria juncea</i> L. http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000475.htm. Accessed 25 June 2012.</p>	<p>1.a. Leaves and stems are dried since animals do not eat sunnhemp when it is green. 1.b. Leaves are fed as a high protein supplement to other poorer feeds. In Sri Lanka dried leaves, bark and boiled seeds are fed to cattle. With restrictions, seed has been used as fodder in the former Soviet Union and southern Africa.</p>
4.05	<p>1. Joy, R. USDA NRCS. 2003. Sunnhemp: A cover crop for southern and tropical farming systems. Soil Quality – Agronomy Technical Note No. 10. Washington, DC. http://plants.usda.gov/plantguide/pdf/pg_crju.pdf. 2. Mannetje, L.'t. FAO. <i>Crotalaria juncea</i> L. http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000475.htm. Accessed 25 June 2012. 3. Cook, C.G. & G.A. White. 1996. <i>Crotalaria juncea</i>: A potential multi-purpose fiber crop. p. 389-394. In: J. Janick (ed.), <i>Progress in new crops</i>. ASHA, Arlington, VA. Web. http://www.hort.purdue.edu/newcrop/proceedings1996/v3-389.html. Accessed 3 July 2012.</p>	<p>1. Contain toxic alkaloids, particularly the seeds and pods. (**Score change if evaluating the cultivar 'Tropic Sun.' 1. It is non-toxic to poultry and livestock shown by laboratory tests and feeding trials.). 2. Sunnhemp should not be fed to horses, and the intake of hay by cattle should be restricted to about 10% of their diet; although sunnhemp hay can be safely incorporated at up to 45% level in rations of sheep under an intensive feeding system (sheep will not suffer any adverse effects if forced to eat dried forage, but will suffer from toxicity if fed large quantities of seed). 3. Poisoning has been known to occur in horses (Nobre et al 1994) and pigs (Zhang 1985) when seed has been ingested.</p>

4.06	<p>1. Maroyi, A., 2011. <i>Crotalaria juncea</i> L. [Internet] Record from Protabase. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. < http://database.prota.org/search.htm>. Accessed 6 July 2012. 2. CABI (https://www.cabi.org/isc/datasheet/17189 accessed 12/1/2017); 3. Cook, C.G. & G.A. White. 1996. <i>Crotalaria juncea</i>: A potential multi-purpose fiber crop. p. 389-394. In: J. Janick (ed.), Progress in new crops. ASHA, Arlington, VA. Web. http://www.hort.purdue.edu/newcrop/proceedings1996/v3-389.html. Accessed 3 July 2012. 4. USDA NRCS plant guide SUNN HEMP <i>Crotalaria juncea</i> L. (https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/njpmcpg11706.pdf accessed 12/1/2017) 5. Treadwell and Alligood (2007) The Cover Crop Corner: Sunn Hemp (<i>Crotalaria juncea</i> L.). A vegetable Crops Extension Publication (http://hos.ufl.edu/vegetarian/07/July%2007/July07_DDT_VeggieT_Sunhemp.pdf accessed 12/1/2017).</p>	<p>1. It is vulnerable to many diseases and pests that also affect crops like cowpea, soybean, groundnut and pigeon pea. <i>Bemisia tabaci</i> (whitefly) is an important vector for the transfer of virus diseases. 2. <i>Amsacta moorei</i> (tiger moth); <i>Argina astrea</i>; <i>Ceratocystis fimbriata</i> (<i>Ceratocystis</i> blight); <i>Choanephora cucurbitarum</i> (<i>Choanephora</i> fruit rot); <i>Colletotrichum dematium</i> (leaf spot); <i>Colletotrichum truncatum</i> (soyabean anthracnose); Cowpea severe mosaic virus; <i>Echinochloa crus-galli</i> (barnyard grass); <i>Helicotylenchus dihystra</i> (common spiral nematode); <i>Lampides boeticus</i> (pea blue butterfly); <i>Macrophomina phaseolina</i> (charcoal rot of bean/tobacco); <i>Pleiochaeta setosa</i> (lupin leaf spot); <i>Pratylenchus vulnus</i> (walnut root lesion nematode); <i>Pythium aphanidermatum</i> (damping-off); <i>Spodoptera litura</i> (taro caterpillar); Sunn-hemp mosaic virus (cowpea Mosaic Virus); Tomato spotted wilt virus (tomato spotted wilt); <i>Utetheisa pulchella</i> (harlequin moth); <i>Xanthomonas axonopodis</i> pv. <i>vignicola</i> (bacterial: cowpea blight) 3. No serious diseases have developed in South Texas and few have been reported for the United States. 4. <i>C. juncea</i> is a naturally poor host for nematodes and it produces allelopathic compounds that suppress sedentary plant-parasitic nematodes such as root-knot (<i>Meloidogyne</i> sp.), soybean cyst (<i>Heterodera glycines</i>), and reniform nematodes (<i>Rotylenchulus reniformis</i>) (Wang and McSorley, 2009). <i>C. juncea</i> is susceptible to diseases such as <i>Fusarium</i> wilt (<i>Fusarium udum</i> var. <i>crotalariae</i>) and anthracnose; and pests such as the sunn hemp moth (<i>Utetheisa pulchella</i>), pod borers, and stink bugs (<i>Nezara viridula</i>) (Wang and McSorley, 2009). Rotate fields at least every 3 years to avoid outbreaks of pests and diseases. 5. Few serious diseases of sunn hemp have been reported.</p>
4.07		No evidence found
4.08	1. USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov , 2 July 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA.	1. Resistant to fire.
4.09	1. USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov , 2 July 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA.	1. Intolerant to shade.
4.10	1. USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov , 2 July 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA. 2. Joy, R. USDA NRCS. 2003. Sunn hemp: A cover crop for southern and tropical farming systems. Soil Quality – Agronomy Technical Note No. 10. Washington, DC.. http://plants.usda.gov/plantguide/pdf/pg_crju.pdf .	1. Adapted to fine-textured soils with low fertility. 2. Performs better on poor sandy soils than most crops.
4.11	1. USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov , 2 July 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA. 2. Cook, B.G., et al. 2005. Tropical Forages: an interactive selection tool., CSIRO, DPI&F(Qld), CIAT and ILRI, Brisbane, Australia. Web. http://www.tropicalforages.info/ . 3 July 2012.	1. Family: Fabaceae; forb/herbaceous growth habit. 2. Herbaceous annual shrub (1-) 2-3 (-4) m tall.
4.12	1.a-b. Mannetje, L.'t. FAO. <i>Crotalaria juncea</i> L. http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000475.htm . Accessed 25 June 2012.	[As evidenced in photos via the internet and the following reference]: 1. Due to the shade of its dense canopy it is also used as a cover crop to suppress weed populations.
5.01	1. Maroyi, A., 2011. <i>Crotalaria juncea</i> L. [Internet] Record from Protabase. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. < http://database.prota.org/search.htm >. Accessed 6 July 2012.	1. Adapted to hot, semi-arid and arid areas; not tolerant to prolonged waterlogging.

5.02	1. USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov , 2 July 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA.	1. Family: Fabaceae.
5.03	1. USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov , 2 July 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA & Joy, R. USDA NRCS. 2003. Sunn hemp: A cover crop for southern and tropical farming systems. Soil Quality – Agronomy Technical Note No. 10. Washington, DC.. http://plants.usda.gov/plantguide/pdf/pg_crju.pdf .	1. Family: Fabaceae. High nitrogen fixation (100 lbs. of N/ac); forb/herbaceous, non-woody growth habit.
5.04	1. USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov , 2 July 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA.	1. Not propagated by bulbs, corms, or tubers.
6.01		See below (6.02)
6.02	1. USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov , 2 July 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA. 2. Cook, C.G. & G.A. White. 1996. <i>Crotalaria juncea</i> : A potential multi-purpose fiber crop. p. 389-394. In: J. Janick (ed.), <i>Progress in new crops</i> . ASHA, Arlington, VA. Web. http://www.hort.purdue.edu/newcrop/proceedings1996/v3-389.html . Accessed 3 July 2012. 3. Treadwell, D. D., and M. Alligood. 2008. Sunn hemp (<i>Crotalaria juncea</i> L.): a summer cover crop for Florida vegetable producers. Publication #HS1126. Univ. of Florida IFAS Extension. http://edis.ifas.ufl.edu/hs376	1. Propagated by seed. Fruit/seed year round. 2. Very little seed production has occurred in the continental United States due to the lateness in flowering (photoperiod-sensitive; flowering begins in response to short days). 3. Because it does not develop seed north of 28°N latitude (Treadwell and Alligood, 2008), there is little threat to the plant spreading or becoming weedy within the continental US. (28°N latitude runs through the state at Clearwater/Tampa).
6.03		No evidence
6.04	1. Cook, B.G., et al. 2005. <i>Tropical Forages: an interactive selection tool.</i> , CSIRO, DPI&F(Qld), CIAT and ILRI, Brisbane, Australia. Web. http://www.tropicalforages.info/ . 3 July 2012.	1. A highly cross-pollinated species. Self-pollination only takes place after the stigmatic surface is stimulated by bee (insect) or mechanically.
6.05	1. 1.a-b. Mannelje, L.'t. FAO. <i>Crotalaria juncea</i> L. http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000475.htm . Accessed 25 June 2012.	1. Insect pollinated.
6.06	1. USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov , 2 July 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA.	1. No vegetative spread.
6.07	1. Mannelje, L.'t. FAO. <i>Crotalaria juncea</i> L. http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000475.htm . Accessed 25 June 2012. 2. Wells, M.J., et al. <i>Catalogue of problem plants of southern Africa</i> . Memoirs of the Botanical Survey of South Africa No. 53. Republic of South Africa; Botanical Research Institute, 1986. Print.	1. Fast growing. 2. Life cycle: annual.
7.01	1. Maroyi, A., 2011. <i>Crotalaria juncea</i> L. [Internet] Record from Protabase. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. < http://database.prota.org/search.htm >. Accessed 6 July 2012.	No adaptations that would suggest that it could attach itself. 1. Fruit a cylindrical pod 30-55 mm x 12-17 mm short, velvety hairy, 6-12 seeded. Seeds oblique-cordiform, 6-7 mm long, dark brown to black.
7.02	1. USDA/ARS-GRIN [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/taxgenform.pl?language=en (02 July 2012). 2. Mannelje, L.'t. FAO. <i>Crotalaria juncea</i> L. http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000475.htm . Accessed 25 June 2012.	Species is being considered for introduction as a biomass crop. 1. Environmental (soil improver), animal food (potential as forage), materials (fiber), medicines (folklore), vertebrate poisons (mammals). 2. Extensively cultivated for fibre or green manure.

7.03	<p>1. Maroyi, A., 2011. <i>Crotalaria juncea</i> L. [Internet] Record from Protabase. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. < http://database.prota.org/search.htm>. Accessed 6 July 2012. 2. Mannelje, L.'t. FAO. <i>Crotalaria juncea</i> L. http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000475.htm . Accessed 25 June 2012.</p>	<p>1. <i>Crotalaria juncea</i> is one of the most widely grown green manure crops of the tropics, often in rotation or as an intercrop with rice, maize, sorghum, tobacco, cotton, sugarcane, pineapple, coffee and in orchards. 2. Extensively cultivated for fibre or green manure.</p>
7.04	<p>1. Maroyi, A., 2011. <i>Crotalaria juncea</i> L. [Internet] Record from Protabase. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. < http://database.prota.org/search.htm>. Accessed 6 July 2012. 2. Massey (2010) Evaluation of a New Sunn Hemp (<i>Crotalaria juncea</i> L.) Cultivar in Alabama. Masters thesis, Auburn University, Auburn, Alabama (http://etd.auburn.edu/bitstream/handle/10415/2413/Massey-thesis.pdf?sequence=2&isAllowed=y Accessed 12/1/2017)</p>	<p>No adaptations for wind dispersal (i.e., lacks wings). 1. Fruit a cylindrical pod 30-55 mm x 12-17 mm short, velvety hairy, 6-12 seeded. Seeds oblique-cordiform, 6-7 mm long, dark brown to black. 2. Wind dispersal is unlikely as the seed is sizable and has smooth surfaces.</p>
7.05		<p>No evidence</p>
7.06	<p>1. Maroyi, A., 2011. <i>Crotalaria juncea</i> L. [Internet] Record from Protabase. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. < http://database.prota.org/search.htm>. Accessed 6 July 2012. 2. Massey (2010) Evaluation of a New Sunn Hemp (<i>Crotalaria juncea</i> L.) Cultivar in Alabama. Masters thesis, Auburn University, Auburn, Alabama (http://etd.auburn.edu/bitstream/handle/10415/2413/Massey-thesis.pdf?sequence=2&isAllowed=y Accessed 12/1/2017)</p>	<p>No evidence but not likely, as the seed is quite large. 1. Fruit a cylindrical pod 30-55 mm x 12-17 mm short, velvety hairy, 6-12 seeded. Seeds oblique-cordiform, 6-7 mm long, dark brown to black. 2. Dispersal by animal is also unlikely as sunn hemp is often unpalatable. In the event of ingestion, the coat of sunn hemp heightens viability likelihood in the event the propagule passes through digestive systems.</p>
7.07	<p>1. Maroyi, A., 2011. <i>Crotalaria juncea</i> L. [Internet] Record from Protabase. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. < http://database.prota.org/search.htm>. Accessed 6 July 2012.</p>	<p>No adaptations that would suggest that it could attach itself externally to animals. 1. Fruit a cylindrical pod 30-55 mm x 12-17 mm short, velvety hairy, 6-12 seeded. Seeds oblique-cordiform, 6-7 mm long, dark brown to black.</p>
7.08	<p>1. Mannelje, L.'t. FAO. <i>Crotalaria juncea</i> L. http://www.fao.org/ag/AGP/AGPC/doc/GBASE/data/pf000475.htm . Accessed 25 June 2012. 2. Joy, R. USDA NRCS. 2003. Sunn hemp: A cover crop for southern and tropical farming systems. Soil Quality – Agronomy Technical Note No. 10. Washington, DC. http://plants.usda.gov/plantguide/pdf/pg_crju.pdf. 3. Cook, C.G. & G.A. White. 1996. <i>Crotalaria juncea</i>: A potential multi-purpose fiber crop. p. 389-394. In: J. Janick (ed.), Progress in new crops. ASHA, Arlington, VA. Web. http://www.hort.purdue.edu/newcrop/proceedings1996/v3-389.html. Accessed 3 July 2012. 4. Massey (2010) Evaluation of a New Sunn Hemp (<i>Crotalaria juncea</i> L.) Cultivar in Alabama. Masters thesis, Auburn University, Auburn, Alabama (http://etd.auburn.edu/bitstream/handle/10415/2413/Massey-thesis.pdf?sequence=2&isAllowed=y Accessed 12/1/2017)</p>	<p>No evidence. 1. Animals do not eat Sunn hemp when it is green (leaves and stems are dried; seeds boiled prior to fodder consumption). 2. Contain toxic alkaloids, particularly the seeds and pods. 3. Poisoning has been known to occur in horses (Nobre et al 1994) and pigs (Zhang 1985) when seed has been ingested. 4. Dispersal by animal is also unlikely as sunn hemp is often unpalatable. In the event of ingestion, the coat of sunn hemp heightens viability likelihood in the event the propagule passes through digestive systems.</p>
8.01	<p>1. Cook, B.G., et al. 2005. Tropical Forages: an interactive selection tool., CSIRO, DPI&F(Qld), CIAT and ILRI, Brisbane, Australia. Web. http://www.tropicalforages.info/. 3 July 2012. 2. Cook, C.G. & G.A. White. 1996. <i>Crotalaria juncea</i>: A potential multi-purpose fiber crop. p. 389-394. In: J. Janick (ed.), Progress in new crops. ASHA, Arlington, VA. Web. http://www.hort.purdue.edu/newcrop/proceedings1996/v3-389.html. Accessed 3 July 2012.</p>	<p>1. Seed yields under optimum conditions range from 1.8-2.5 t/ha (3968.3-5511.6 lbs), but more commonly from 0.5-1.0 t/ha (1102.3-2204.6 lbs). 2. Very little seed production has occurred in the continental United States due to the lateness in flowering (photoperiod-sensitive; flowering begins in response to short days).</p>

8.02	<p>1. McKee, R., G.E. Ritchey, J.L. Stephens, and H.W. Johnson. 1946. <i>Crotalaria</i> culture and utilization. Farmers' Bull.1980. U.S. Gov. Print. Office, Washington, D.C. (as cited in Massey (2010) Evaluation of a New Sunn Hemp (<i>Crotalaria juncea</i> L.) Cultivar in Alabama. Masters thesis, Auburn University, Auburn, Alabama (http://etd.auburn.edu/bitstream/handle/10415/2413/Massey-thesis.pdf?sequence=2&isAllowed=y Accessed 12/1/2017))</p>	<p>Not enough evidence to answer 'yes', but likely (therefore answered ?, not unk) 1.Sunn hemp is able to volunteer in cultivated fields over a number of years, possibly providing a propagule bank</p>
8.03	<p>1. Cook, B.G., et al. 2005. Tropical Forages: an interactive selection tool., CSIRO, DPI&F(Qld), CIAT and ILRI, Brisbane, Australia. Web. http://www.tropicalforages.info/. 3 July 2012. 2. Massey (2010) Evaluation of a New Sunn Hemp (<i>Crotalaria juncea</i> L.) Cultivar in Alabama. Masters thesis, Auburn University, Auburn, Alabama (http://etd.auburn.edu/bitstream/handle/10415/2413/Massey-thesis.pdf?sequence=2&isAllowed=y Accessed 12/1/2017)</p>	<p>1. Related species susceptible to 2,4-D. Minimal phytotoxicity reported for several pre-emergence herbicides including clomazone at 1.38 kg a.i./ha. 2. Although sunn hemp has no registered herbicides (Cook and White, 1996), unwanted tropical sunn hemp is effectively controlled by 2,4-D (2,4-dichlorophenoxyacetic acid) application</p>
8.04	<p>1. USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov, 2 July 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA. 2. Massey (2010) Evaluation of a New Sunn Hemp (<i>Crotalaria juncea</i> L.) Cultivar in Alabama. Masters thesis, Auburn University, Auburn, Alabama (http://etd.auburn.edu/bitstream/handle/10415/2413/Massey-thesis.pdf?sequence=2&isAllowed=y Accessed 12/1/2017)</p>	<p>1. No coppice or resprout ability. 2. Although sunn hemp seedlings are vulnerable to mechanical damage (Yost and Evans, 1988), cutting sunn hemp at 90 cm 100 d after planting increased biomass production and flowering (Abdul-baki et al., 2001).</p>
8.05		<p>No evidence</p>