Taxon: Psophocarpus tetragonolobus (L.) DC. **Family:** Fabaceae

Common Name(s): asparagus pea
four angle bean
Goa bean
princess pea
winged bean

Synonym(s): Botor tetragonolobus (L.) Kuntze
Dolichos tetragonolobus L.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 3 Jun 2019

WRA Score: 0.0 **Designation:** L **Rating:** Low Risk

Keywords: Domesticated Legume, Perennial Vine, Edible, Tuberous Roots, Self-Compatible

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	y
102	Has the species become naturalized where grown?	y=1, n=-1	y
103	Does the species have weedy races?	y=1, n=-1	n
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	Low
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed		
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals		
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans		

Qsn #	Question	Answer Option	Answer
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	y
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	y
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	n
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**y**
	Source(s)	**Notes**
	Hymowitz, T., & Boyd, J. (1977). Origin, Ethnobotany and Agricultural Potential of the Winged Bean: Psophocarpus tetragonolobus. Economic Botany, 31(2), 180-188	"In New Guinea, P. tetragonolobus is cultivated for its pod, grain, flowers, leaves, and tuberous roots (25). Ryan (68) ventures that New Guinea may well be the origin of the winged bean and that the domesticate is of some antiquity in the region. Although the data presented are by no means conclusive, the meager evidence available points to Papua and New Guinea as the most likely center of geographical origin, or at the minimum a center of germplasm diversity, for P. tetragonolobus"
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 27 May 2019]	"Psophocarpus tetragonolobus is known only in cultivation; truly wild specimens have never been found. The greatest diversity is found in New Guinea and the hills of north-eastern India and neighbouring Myanmar (Burma), which are probable centres of domestication." … "Psophocarpus comprises about 10 species, all native to tropical Africa, except Psophocarpus tetragonolobus. Some authors consider the wild Psophocarpus grandiflorus R.Wilczek, others Psophocarpus scandens (Endl.) Verdc. (African winged bean), as progenitor of Psophocarpus tetragonolobus. Psophocarpus palustris Desv. is also closely related. However, it has also been suggested that Psophocarpus tetragonolobus developed from an extinct wild Asian species. It is characterized by its comparatively large flowers, short bracteoles and glabrescent leaves, and by its often long fruits."

102	**Has the species become naturalized where grown?**	**y**
	Source(s)	**Notes**
	Jardim Botânico do Rio de Janeiro. 2019. Fabaceae in Flora do Brasil 2020 under construction. http://www.reflora.jbrj.gov.br. [Accessed 30 May 2019]	"Psophocarpus tetragonolobus … Naturalized … Geographic distribution Confirmed occurrences: North (Amazonas) Northeast (Bahia, Maranhão, Pernambuco) South (Paraná)"
	Heenan, P. B., De Lange, P. J., Glenny, D. S., Breitwieser, I., Brownsey, P. J., & Ogle, C. C. (1999). Checklist of dicotyledons, gymnosperms, and pteridophytes naturalised or casual in New Zealand: additional records 1997–1998. New Zealand Journal of Botany, 37(4), 629-642	[Possibly naturalized or persisting] "Psophocarpus tetragonolobus (L.) DC princess bean, winged bean, asparagus pea ADDITIONAL RECORD: AK 223888, P. J. de Lange 2262, 1 Dec 1993, Waikato, Te Kauwhata, Swan Road. NOTES: On a roadside bank beneath a hedge. Also known as Lotus tetragonolobus or Tetragonolobus purpureus. For reference see Webb et al. (1988, p. 656)."

103	**Does the species have weedy races?**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

Qsn #	Question	Answer
201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**High**
	Source(s)	**Notes**
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 27 May 2019]	"Psophocarpus tetragonolobus is known only in cultivation; truly wild specimens have never been found. The greatest diversity is found in New Guinea and the hills of north-eastern India and neighbouring Myanmar (Burma), which are probable centres of domestication."
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"The genus Psophocarpus contains nine species, eight of which are wild and one, winged bean is only known in cultivation. The wild species have been collected only in Africa, Madagascar and the Mascarene island, winged bean has an Asiatic distribution from Mauritius to New Guinea. New Guinea and southeast Asia especially Indonesia have many varieties and strains that point to them being the centre of diversity for winged bean. Some researchers assert that it could have an African ancestry."

202	**Quality of climate match data**	**Low**
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 30 May 2019]	[Elevation range of 2000 m in tropical climates, demonstrating environmental versatility] "Winged bean is best adapted to equatorial climates. It is cultivated from sea-level up to 2000 m altitude, but does not tolerate night frost. Day temperatures of 25–32ºC and night temperatures above 18ºC are optimal for growth and reproductive development. Tuber initiation is favoured by cooler conditions. Winged bean requires at least 1000 mm annual rainfall, but is intolerant to waterlogging. Winged bean is a quantitative short-day plant, flower induction requiring a critical daylength of around 12 hours."

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Preferred Climate/s: Subtropical, Tropical"

Qsn #	Question	Answer
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"The wild species have been collected only in Africa, Madagascar and the Mascarene island, winged bean has an Asiatic distribution from Mauritius to New Guinea. New Guinea and southeast Asia especially Indonesia have many varieties and strains that point to them being the centre of diversity for winged bean. Some researchers assert that it could have an African ancestry. Winged bean is widely cultivated in the tropics, especially in Myanmar, India, Malaysia, Indonesia, Thailand, Vietnam, Sri Lanka, Bangladesh, West Africa, New Guinea, the West Indies, South America and even South Florida."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	Verdcourt, B., & P. Halliday. (1978). A Revision of Psophocarpus (Leguminosae-Papilionoideae-Phaseoleae). Kew Bulletin, 33(2), 191-227	"Apart from the specimens cited, P. tetragonolobus has been cultivated in the following countries either extensively or experimentally-Australia, Bangladesh, Belize, Cameroon, Colombia, Costa Rica, Ecuador, Egypt, Fiji, Granada, Honduras, Ivory Coast, Jamaica, Nicaragua, S . Korea, Sri Lanka, Taiwan and United States."
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"In Hawai'i a sunny location with average garden soil and a fence, trellis, or other support on which to climb are all that is needed to grow winged bean as a vegetable. Seeds are sometimes available in local garden supply centers or from mail-order catalogs, but many gardeners prefer to save seed and replant from their own stock. Although the species as a whole is highly variable in characters such as plant size, flower color, and fruit size, in Hawai'i winged beans are remarkably uniform in appearance, with pale bluish to mauve flowers and bright green fruit about 6" long."
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"Winged bean is widely cultivated in the tropics, especially in Myanmar, India, Malaysia, Indonesia, Thailand, Vietnam, Sri Lanka, Bangladesh, West Africa, New Guinea, the West Indies, South America and even South Florida."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Eagleton, G. (1999). Winged bean in Myanmar, revisited. Economic Botany, 53(3), 342-352	"Farmers were asked if they ever saw winged bean in a wild state, either as an escape from cultivation or naturalised in forests and, in all cases, reported that they had only ever seen winged bean in current or past areas of cultivation. This observation is similar to published reports from other regions of winged bean cultivation."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Psophocarpus tetragonolobus (L.) DC. Fabaceae - Papilionaceae Total N° of Refs: 3 Habit: Vine Preferred Climate/s: Subtropical, Tropical Origin: E Asia Major Pathway/s: Crop, Herbal, Ornamental Dispersed by: Humans References: New Zealand-N-823, Brazil-N- 1597, New Zealand-U-2048."

Qsn #	Question	Answer
	McCormack, G. 2007. Cook Islands Biodiversity Database, Version 2007.2. Cook Islands Natural Heritage Trust, Rarotonga. http://cookislands.bishopmuseum.org. [Accessed 30 May 2019]	"Psophocarpus tetragonolobus … Introduced - Recent, Not naturalised; Land, lowlands"
	Wunderlin, R. P., B. F. Hansen, A. R. Franck, and F. B. Essig. (2019). Atlas of Florida Plants. http://florida.plantatlas.usf.edu/. [Accessed 30 May 2019]	"Psophocarpus tetragonolobus … Locality: USA. Florida. Miami-Dade Co.: E side of SW 122nd Avenue, 0.3 km S of SW 232nd Street, 1 km E of US 1. 25º 32’ 57” N 80º 23’ 18” W Habitat: Roadside."
	Jardim Botânico do Rio de Janeiro. 2019. Fabaceae in Flora do Brasil 2020 under construction. http://www.reflora.jbrj.gov.br. [Accessed 30 May 2019]	"Psophocarpus tetragonolobus … Naturalized … Geographic distribution Confirmed occurrences: North (Amazonas) Northeast (Bahia, Maranhão, Pernambuco) South (Paraná)"
	Heenan, P. B., De Lange, P. J., Glenny, D. S., Breitwieser, I., Brownsey, P. J., & Ogle, C. C. (1999). Checklist of dicotyledons, gymnosperms, and pteridophytes naturalised or casual in New Zealand: additional records 1997–1998. New Zealand Journal of Botany, 37(4), 629-642	[Possibly naturalized or persisting] "Psophocarpus tetragonolobus (L.) DC princess bean, winged bean, asparagus pea ADDITIONAL RECORD: AK 223888, P. J. de Lange 2262, 1 Dec 1993, Waikato, Te Kauwhata, Swan Road. NOTES: On a roadside bank beneath a hedge. Also known as Lotus tetragonolobus or Tetragonolobus purpureus. For reference see Webb et al. (1988, p. 656)."
	Wagner, W.L., Herbst, D.R.& Lorence, D.H. (2019). Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/. [Accessed 30 May 2019]	No evidence in Hawaiian Islands to date

302	Garden/amenity/disturbance weed	n
	Source(s)	**Notes**
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l’Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed]	"Psophocarpus tetragonolobus is known only in cultivation; truly wild specimens have never been found." [No evidence. Cultivated and valued as a crop]

303	Agricultural/forestry/horticultural weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[No evidence] "Psophocarpus tetragonolobus (L.) DC. Fabaceae - Papilionaceae Total N° of Refs: 3 Habit: Vine Preferred Climate/s: Subtropical, Tropical Origin: E Asia Major Pathway/s: Crop, Herbal, Ornamental Dispersed by: Humans References: New Zealand-N-823, Brazil-N-1597, New Zealand-U-2048."

304	Environmental weed	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 30 May 2019]	"Psophocarpus tetragonolobus is known only in cultivation; truly wild specimens have never been found. "
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

305	Congeneric weed	
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Psophocarpus palustris and Psophocarpus scandens may be naturalized, and potentially weedy, but evidence of detrimental impacts has not been documented at this time.

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Verdcourt, B., & P. Halliday. (1978). A Revision of Psophocarpus (Leguminosae-Papilionoideae-Phaseoleae). Kew Bulletin, 33(2), 191-227	[No evidence] "Climbing annual or perennial herb up to 3-4 m long with glabrous stems. Leaflets ovate-triangular, 4-15 X 3·5-12 cm, acute at the apex, truncate or rounded at the base; stipules ovate to lanceolate with similarly shaped spur, 0·8-1 ·2 cm long. Flowers 2-IO in inflorescences 1-10 cm long on peduncles 5-15 cm long; bracteoles rounded, 2·5-4·5 X 2·5-3·5 mm. Sepals green to dark red-purple; corolla mauve or various mixtures of mauve, cream, blue and yellow-green or red or occasionally white; standard 2·5-4 cm long. Fruits oblong to linear-oblong, (6-)8·6-26(-40) X 2-3·5 cm, with serrated wings 0·3-1 cm wide, the body of the fruit yellow-green or green, sometimes with red flecking, very rough to quite smooth in texture, the wings green to red or purple or flecked. Seeds 5-21, white, yellow, brown, black or variously mottled, subglobose, about 0·6-1 cm long, glabrous, with a small rim aril."

402	Allelopathic	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Zhao, Z., Huang, Y., Chen, S., Zheng, S., Huang, Y., & Liu, Z. (2010). Comparisons on Allelopathic Potentials of Vegetative Organs of Psophocarpus tetragonolobus. Journal of Zhaoqing University, 5.	[Extracts exhibit some allelopathic properties in lab experiment] "In order to compare allelopathic potentials of aqueous extracts between roots, stems and leaves of P. tetragonolobus, the biological detection method had been conducted on seed germination and seeding growth of Raphanus sativus and Brassica parachinensis. With rising disposal concentrations of aqueous extracts from roots,stems and leaves of P.tetragonolobus,there were increasing trends forinhibitions on seed germination ratio of R.sativus and B.parachinensis.The aqueous extracts from roots and stems of P.tetragonolobus inhibited radicle growth of R. sativus and B. parachinensis and the inhibiting effects of aqueous extracts from roots was higher than from stems. The aqueous extracts from leaves exhibited stimulations. There were different extent stimulations foraqueous extracts from roots, stems and leaves of P. tetragonolobus on hypocotyl growth of R. sativus and B. parachinensis. The treatment effects of aqueous extracts from leaves of P. tetragonolobus were distinct on root mass/crown mass ratio of R. sativus, but that from roots and stems were no evidence. The treatment of aqueous extracts from roots, stems and leaves of P. tetragonolobus reduced root mass/crown mass ratio of B. parachinensis obviously, and that from roots were more visibility."

403	Parasitic	n
	Source(s)	**Notes**
	Verdcourt, B., & P. Halliday. (1978). A Revision of Psophocarpus (Leguminosae-Papilionoideae-Phaseoleae). Kew Bulletin, 33(2), 191-227	"Climbing annual or perennial herb up to 3-4 m long with glabrous stems." [Fabaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"Winged bean is sometimes planted as an ornamental because of its attractive flowers. The whole plant as well as processed seeds is good animal feed. The cake left after extraction of oil from the seeds can be used for stock-feed."

Qsn #	Question	Answer
405	**Toxic to animals**	
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"Winged bean is sometimes planted as an ornamental because of its attractive flowers. The whole plant as well as processed seeds is good animal feed. The cake left after extraction of oil from the seeds can be used for stock-feed." [No evidence]
	Nwokolo, E. (1996) Winged bean (Psophocarpus tetragonolobus(L.) DC.). In: Nwokolo E., Smartt J. (eds) Food and Feed from Legumes and Oilseeds. Springer, Boston, MA	[Raw seeds may be toxic] "That some of the reported toxicity of winged bean is due to its content of haemagglutinins has been demonstrated by Jaffe and Korte (1976). They detected haemagglutinin activity of +3 with normal rabbit erythrocytes and +5 with pronase-treated erythrocytes from a 1:10 sodium chloride extract of winged bean. They demonstrated that feeding raw beans to rats caused considerable mortality in 2 weeks; there was no mortality when the bean was autoclaved."

406	**Host for recognized pests and pathogens**	
	Source(s)	**Notes**
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 30 May 2019]	"Winged bean is not much affected by pests and diseases, and chemical spraying or other control measures are rarely applied. False rust or orange gall (Synchytrium psophocarpi) is perhaps the most widespread and damaging fungus. Cultivar resistance has been reported. Dark leaf spot (Pseudocercospora psophocarpi) is serious in hot humid areas. Powdery mildew (Erysiphe cichoracearum) occurs in cooler areas during periods of high air humidity in the dry season. Other diseases are web blight (Rhizoctonia solani) and flower blight (Choanephora cucurbitarum). Ring spot mosaic virus and necrotic mosaic virus were identified on winged bean in Côte d'Ivoire. Root-knot nematodes (Meloidogyne spp.) may cause stunted growth and yellowing of leaves. Amongst insect pests, bean pod-borer (Maruca testulalis) and various leaf feeding caterpillars, bugs and cicadellids have been reported."

407	**Causes allergies or is otherwise toxic to humans**	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"All the plant parts, viz., seeds, tender, immature pods, young leaves, flowers and tubers are edible and consumed as food. The tuberous roots are eaten both cooked and raw in Papua New Guinea and Myanmar. The tubers are exceedingly rich in protein >10%, are white fleshed, firm and have a pleasant nutty flavour. Young pods at the 10–15 cm stage are eaten raw and cooked. In Indonesia, young leaves and shoots and young pods are eaten raw or steamed as lalab and in sayor , in a side dish with rice called trantjam ketjepir made up of sliced young tender pods mixed with similarly sliced cucumber and sambal . Young leaves are cooked and eaten as greens. In Malaysia, the young tender pods are eaten raw as ulam (vegetable salad) usually with sambal belachan . Also the young pods are sliced and fried with sambal and pounded dried shrimps. Ripe seeds are eaten as delicacy in pindang or eaten roasted. Flowers and flower buds eaten as petjel in Java. Flowers are also used to colour rice and pastries. In Madura, ripe seeds are fried as like kacang goreng . The seeds are also rich in proteins and has similar uses to that of soya beans – edible oil, milk, tofu, bean curd, tempeh, miso etc. Winged bean flour can be employed as protein supplement in bread making."
	Hymowitz, T., & Boyd, J. (1977). Origin, Ethnobotany and Agricultural Potential of the Winged Bean: Psophocarpus tetragonolobus. Economic Botany, 31(2), 180-188	"Pospisil et al. (5 7) laud the winged bean for not having the urease enzyme and "any poisonous substances." Contrarily, Sohonie and Bhandarkar (71) found trypsin inhibitor in winged beans, and Toms and Western (75) reported that seeds of P. tetragonolobus contain phytohaemagglutinins, which cause nonspecific haemagglutination."
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Seeds contain several toxins. Pods antimicrobial, fungicidal. Leaves decoction bactericidal, used as a lotion upon the skin for smallpox; leaves and seeds eaten to cure skin sores, boils and ulcers. Tuberous roots tonic; roots antimicrobial, fungicidal."
	WRA Specialist. (2019). Personal Communication	Seeds contain toxins, and could possibly poison people.

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	**Notes**
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 31 May 2019]	[No evidence. A cultivated plant of wetter areas] "Psophocarpus tetragonolobus is known only in cultivation; truly wild specimens have never been found." … "Winged bean requires at least 1000 mm annual rainfall, but is intolerant to waterlogging."

Qsn #	Question	Answer
409	**Is a shade tolerant plant at some stage of its life cycle**	**n**
	Source(s)	**Notes**
	Plants for a Future. (2019). Psophocarpus tetragonolobus. https://pfaf.org. [Accessed 3 Jun 2019]	"It cannot grow in the shade."
	Dave's Garden. (2019). Asparagus Bean, Goa bean, Princess Bean, Winged Bean - Psophocarpus tetragonolobus. https://davesgarden.com/guides/pf/go/67023/. [Accessed 3 Jun 2019]	"Sun Exposure: Full Sun"

410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	**y**
	Source(s)	**Notes**
	Martin, F. W. & Delpin, H. (1978). Vegetables for the hot, humid tropics. Part 1. The winged bean, Psophocarpus tetragonolobus. USDA, Agricultural Research Service, Mayaguez, P.R.	"The soils for the winged bean can be extremely varied. The winged bean will tolerate heavy soils and poor drain age and is therefore often grown along riverbanks. The plants are less vigorous and more susceptible to nematodes in sandy soils, but the tuberous roots are larger. The winged bean can grow successfully in infertile soils, probably because of its nitrogen-fixing capacity."
	Tanzi, A. S., Eagleton, G. E., Ho, W. K., Wong, Q. N., Mayes, S., & Massawe, F. (2019). Winged bean (Psophocarpus tetragonolobus (L.) DC.) for food and nutritional security: synthesis of past research and future direction. Planta, 1-21	"Winged bean plant has great capacity to nodulate (see supplementary material; figure N.1), fix nitrogen and survive on a range of tropical soils: from poor acidic clay and loam soils in Puerto Rico (Anonymous 1980), to sandy, swamp peats and heavy clay soils in Myanmar and PNG (Burkill 1906; Khan et al. 1977)."
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 30 May 2019]	"Winged bean thrives on a range of soil types with a pH above 5.5. "
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"Winged bean thrives on a range of well-drained, friable soil types with a pH above 5.5. It is intolerant of water logging."

411	**Climbing or smothering growth habit**	**y**
	Source(s)	**Notes**
	Verdcourt, B., & P. Halliday. (1978). A Revision of Psophocarpus (Leguminosae-Papilionoideae-Phaseoleae). Kew Bulletin, 33(2), 191-227	"Climbing annual or perennial herb up to 3-4 m long with glabrous stems."

412	**Forms dense thickets**	**n**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 30 May 2019]	"Psophocarpus tetragonolobus is known only in cultivation; truly wild specimens have never been found."
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	[No evidence] "The genus Psophocarpus contains nine species, eight of which are wild and one, winged bean is only known in cultivation. The wild species have been collected only in Africa, Madagascar and the Mascarene island, winged bean has an Asiatic distribution from Mauritius to New Guinea. New Guinea and southeast Asia especially Indonesia have many varieties and strains that point to them being the centre of diversity for winged bean. Some researchers assert that it could have an African ancestry. Winged bean is widely cultivated in the tropics, especially in Myanmar, India, Malaysia, Indonesia, Thailand, Vietnam, Sri Lanka, Bangladesh, West Africa, New Guinea, the West Indies, South America and even South Florida."
	Hymowitz, T., & Boyd, J. (1977). Origin, Ethnobotany and Agricultural Potential of the Winged Bean: Psophocarpus tetragonolobus. Economic Botany, 31(2), 180-188	[No evidence] "The winged bean is most widely distributed in Asia. It has been reported in India (27, 37, 63, 64, 65), Burma (20, 66), Malaya (10, 41), Thailand (14, 22), the Philippines (23, 45, 46, 48), Indo-china (33), China (35), Ceylon (29, 43, 51, 67), Indonesia (10, 32, 69, 72), Papua and New Guinea (25, 68, 79) and in several South Pacific islands (6, 52, 53). In addition, the cultigen has been introduced into several African (5, 8, 15, 16, 31) and tropical American countries (30, 34, 70)."

501	Aquatic	n
	Source(s)	**Notes**
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 30 May 2019]	[Terrestrial] "Winged bean is best adapted to equatorial climates. It is cultivated from sea-level up to 2000 m altitude, but does not tolerate night frost."

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 30 May 2019]	Family: Fabaceae (alt.Leguminosae) Subfamily: Faboideae Tribe: Phaseoleae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Tanzi, A. S., Eagleton, G. E., Ho, W. K., Wong, Q. N., Mayes, S., & Massawe, F. (2019). Winged bean (Psophocarpus tetragonolobus (L.) DC.) for food and nutritional security: synthesis of past research and future direction. Planta, 1-21	"Winged bean's effective symbiotic associations with a broad spectrum of rhizobia strains make it a good nitrogen-fixer for low-input and self-resilient agricultural systems (Burkill 1906; Masefield 1961; Anonymous 1980; Ikram and Broughton 1980; Iruthayathas and Vlassak 1982; Klu and Kumaga 1999)."
	Verdcourt, B., & P. Halliday. (1978). A Revision of Psophocarpus (Leguminosae-Papilionoideae-Phaseoleae). Kew Bulletin, 33(2), 191-227	[Non-woody nitrogen fixing herb] "Climbing annual or perennial herb up to 3-4 m long with glabrous stems. Leaflets ovate-triangular, 4-15 X 3·5-12 cm, acute at the apex, truncate or rounded at the base; stipules ovate to lanceolate with similarly shaped spur, 0·8-1 ·2 cm long."

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**y**
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"A climbing, twining perennial vine, 2–4 m long with ridged, glabrous stem and fleshy, fusiform, tuberous roots"… "Winged beans are propagated by seeds."
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 3 Jun 2019]	"In Myanmar (Burma) and New Guinea, special cultivars are grown for the tuberous roots resembling small sweet potatoes."
	Hymowitz, T., & Boyd, J. (1977). Origin, Ethnobotany and Agricultural Potential of the Winged Bean: Psophocarpus tetragonolobus. Economic Botany, 31(2), 180-188	"The species P. tetragonolobus (Fig. 1) is a twinning, perennial herb grown as an annual having tuberous roots and pods with longitudinal wings." … "The use of the tuberous roots for food appears to be restricted to Burma (26) and the South Pacific Islands. The tuberous roots are slightly sweet, firm like an apple (10), and eaten both raw and cooked (21, 52)."

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Verdcourt, B., & P. Halliday. (1978). A Revision of Psophocarpus (Leguminosae-Papilionoideae-Phaseoleae). Kew Bulletin, 33(2), 191-227	[NA] "No wild specimens of P. tetragonolobus have ever been found and if the species is truly an Asian endemic then it has apparently become extinct in the wild. It is clearly closely related to P. scandens, P. palustris and P. grandiflorus having the glabrescent leaves of the former, the short bracteoles of the second and the large flowers of the third yet it is very clearly distinct from all three. Burkill believes it originated in Madagascar or Mauritius where P. scandens is not uncommon. Whether it is an ennobled race of a wild species now lost or was in some way bred from P. scandens is not yet known. I tend to the belief that it is an improved race of a native Asian species."

602	**Produces viable seed**	**y**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 30 May 2019]	"Winged bean is normally propagated by seed, but tubers may also be used. The seeds are very hard and can be kept for several years, but old seed requires scarification before planting. Sowing 2–3 seeds per hole can be practised on raised beds; spacings are 40–60 cm in the row and 90–100 cm between rows. The 1000-seed weight is about 250 g; seed requirement 10–15 kg/ha. In home gardens winged bean is sown against walls, fences, trees or shrubs, and it may climb up to several metres high. Adequate drainage is essential and under wet conditions raised beds may be necessary."
	Nwokolo, E. (1996) Winged bean (Psophocarpus tetragonolobus(L.) DC.). In: Nwokolo E., Smartt J. (eds) Food and Feed from Legumes and Oilseeds. Springer, Boston, MA	"Winged bean seeds are usually planted in and around homesteads in small plots, sometimes of less than 0.5 ha. In small peasant farms the average distance between plants is 26-35 cm and crops are planted in rows, 30 cm apart. It may be cultivated in pure stands but more usually, it is intercropped with com, other beans, soybean, kidney beans and vegetables."

603	Hybridizes naturally	n
	Source(s)	**Notes**
	Maxted, N. (1984). The inter and intra-generic relationships between Psophocarpus spp. and their allies. Master's Thesis. University of Southampton, Southampton, UK	[No evidence] "There are no reported successes in hybridising Psophocarpus spp. with other Phaseolinae genera, and probably no serious systematic attempt has been made. Haq (unpublished) has attempted, unsuccessfully, crosses in both directions between P.tetragonolobus and Phaseolus vulgaris."… Pickersgill (1980) records that Erskine attempted over 100 crosses between P. tetragonolobus and P. scandens, using P. tetragonolobus as the female parent without obtaining hybrids. Pickersgill herself attempted a more limited investigation and found that pods dropped within 48 hours of the cross, regardless of direction in which the cross was made. Haq and Maxted (unpublished) have also attempted a small number of inter-specific crosses without success. Pickersgill (1980) suggests that even were a hybrid produced between P. tetragonolobus and P. scandens the difference in karyotype are such that the hybrid would be extremely sterile."

604	Self-compatible or apomictic	y
	Source(s)	**Notes**
	Tanzi, A. S., Eagleton, G. E., Ho, W. K., Wong, Q. N., Mayes, S., & Massawe, F. (2019). Winged bean (Psophocarpus tetragonolobus (L.) DC.) for food and nutritional security: synthesis of past research and future direction. Planta, 1-21	"It is considered to have a cleistogamous floral system, which would usually imply autogamy, with self-pollination having been observed to take place before the large flowers open in the morning hours (Karikari 1972; Erskine and Bala 1976; Erskine 1980) (see supplementary material; figure F.1). Such observations have been supported by experiments with bagged flowers (Karikari 1972; Anonymous 1980), suggesting that insects are not required for pollination."

Qsn #	Question	Answer
	Martin, F. W. & Delpin, H. (1978). Vegetables for the hot, humid tropics. Part 1. The winged bean, Psophocarpus tetragonolobus. USDA, Agricultural Research Service, Mayaguez, P.R.	"The winged bean is self-fertile, but self-pollination is not automatic. Large wild bees are attracted to the flowers and increase self-pollination and sometimes cause cross-pollination. On the basis of current knowledge, it is best to consider the winged bean as a normally self-pollinated crop with a small amount (perhaps 5 to 10 percent) of cross-pollination."
	Kalloo, G. (1993). Winged bean: Psophocarpus tetragonolobus (L.) DC. In Genetic Improvement of Vegetable Crops (pp. 465-469). Pergamon Press, Oxford	[Selfing possible but results in reduced seed set compared to cross pollination] "Senanayake and Thiruketheeswaran24 described the biology of flowering. The flowers opened at 9 a.m.; anther dehiscence began after 8 p.m. and continued throughout the night; the stigma was receptive for 26 hours before flower opening and for 34 hours after opening; maximum stigma receptivity (90%) was between 8 a.m. and 9 a.m.; although stigmas were fully covered with pollen by 6 a.m., there was only 65% self-fertilization and it did not reach its peak before flower opening; fruit set from flowers cross-pollinated before flower opening was greater than that from flowers dependent on selfing alone."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Martin, F. W. & Delpin, H. (1978). Vegetables for the hot, humid tropics. Part 1. The winged bean, Psophocarpus tetragonolobus. USDA, Agricultural Research Service, Mayaguez, P.R.	"The winged bean is self-fertile, but self-pollination is not automatic. Large wild bees are attracted to the flowers and increase self-pollination and sometimes cause cross-pollination. On the basis of current knowledge, it is best to consider the winged bean as a normally self-pollinated crop with a small amount (perhaps 5 to 10 percent) of cross-pollination."
	Tanzi, A. S., Eagleton, G. E., Ho, W. K., Wong, Q. N., Mayes, S., & Massawe, F. (2019). Winged bean (Psophocarpus tetragonolobus (L.) DC.) for food and nutritional security: synthesis of past research and future direction. Planta, 1-21	[Pollinators not required but cross pollination may increase seed set] "It is considered to have a cleistogamous floral system, which would usually imply autogamy, with self-pollination having been observed to take place before the large flowers open in the morning hours (Karikari 1972; Erskine and Bala 1976; Erskine 1980) (see supplementary material; figure F.1). Such observations have been supported by experiments with bagged flowers (Karikari 1972; Anonymous 1980), suggesting that insects are not required for pollination. Nonetheless, analysis of phenotypic markers (e.g. stem colour) have revealed a 7.6% of out-crossing during the wet season in Papua New Guinea (PNG), facilitated by carpenter bees (Xylocopa aruana) (Erskine 1980)."

Qsn #	Question	Answer
606	**Reproduction by vegetative fragmentation**	**n**
	Source(s)	**Notes**
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 3 Jun 2019]	"Winged bean is normally propagated by seed, but tubers may also be used."
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"Winged beans are propagated by seeds."

607	Minimum generative time (years)	1
	Source(s)	**Notes**
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 30 May 2019]	"Perennial climbing or twining herb, usually grown as an annual" … "Emergence of the seedling under field conditions occurs 5–7 days after sowing. Temperatures around 25ºC appear most suitable for germination and growth. The fibrous root system with large N-fixing nodules (up to 1.5 cm in diameter) grows in proportion to the shoot until about 3 months after planting. In tuberous cultivars, increases in root dry weight continue beyond the 6th month after planting. After about 2 months the plants start flowering, although some local cultivars require as long as 5 months. The flowers are mostly self-pollinated. Fruit development is not greatly affected by environmental conditions. Maximum fruit length and maturity occur about 20 days and 65 days after pollination, respectively"

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans"
	Verdcourt, B., & P. Halliday. (1978). A Revision of Psophocarpus (Leguminosae-Papilionoideae-Phaseoleae). Kew Bulletin, 33(2), 191-227	"Fruits oblong to linear-oblong, (6-)8·6-26(-40) X 2-3·5 cm, with serrated wings 0·3-1 cm wide, the body of the fruit yellow-green or green, sometimes with red flecking, very rough to quite smooth in texture, the wings green to red or purple or flecked. Seeds 5-21, white, yellow, brown, black or variously mottled, subglobose, about 0·6-1 cm long, glabrous, with a small rim aril." [No means of external attachment]

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"Winged bean is widely cultivated in the tropics, especially in Myanmar, India, Malaysia, Indonesia, Thailand, Vietnam, Sri Lanka, Bangladesh, West Africa, New Guinea, the West Indies, South America and even South Florida."

Qsn #	Question	Answer
703	**Propagules likely to disperse as a produce contaminant**	**n**
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	[No evidence. Relatively large pods and seeds intentionally cultivated, with no evidence of inadvertent dispersal documented in the literature] "winged bean is only known in cultivation." … "The fruit (pod) is oblong linear, straight, curved to long and flexuous, 15–30 cm long and 2.5–3.5 cm wide, with four longitudinal serrate-dentate or sinuous leafy wings (Plates 1 – 3). In cross section, the pod is square with the four corners tapering out into the thin wings. They are variously coloured depending on variety from green, yellow-green or purple or green with purplish-red wings (Plates 1 – 3). When fully ripe they turn brown and split open, often with a loud popping noise. The seeds 5–20 per pod are subglobose about 0.5–1 cm across, white, yellow, brown or black, or mottled with a small aril and non-endospermous."

704	**Propagules adapted to wind dispersal**	**n**
	Source(s)	**Notes**
	Verdcourt, B., & P. Halliday. (1978). A Revision of Psophocarpus (Leguminosae-Papilionoideae-Phaseoleae). Kew Bulletin, 33(2), 191-227	[Winged fruit appear to be a retained trait rather than an adaptation for wind dispersal] "The adaptive significance of winged dehiscent fruits in low-growing twiners and prostrate plants is not easy to see unless the genus had its origin in dry savanna where the nearly ripe fruits were blown across the ground. It is not conceivable that the genus derived from forest lianas, the only other possibility in which wind dispersal from high trees would have been aided by winged fruits. Winged fruits are known in several low growing semidesert savanna plants e.g. Pterodiscus, Tribulus, Medicago etc. In such windswept areas any light fruit or seed would surely be adequate to ensure dispersal. Moreover the wings are best developed in the species (scandens, palustris, grandiflorus and tetragonolobus) where this kind of dispersal is least likely to be of great importance. It seems more likely that it is one of the many structures which exist and persist since they are not actively detrimental to the plant's survival."

705	**Propagules water dispersed**	
	Source(s)	**Notes**
	Martin, F. W. & Delpin, H. (1978). Vegetables for the hot, humid tropics. Part 1. The winged bean, Psophocarpus tetragonolobus. USDA, Agricultural Research Service, Mayaguez, P.R.	[Buoyancy of pods and seeds unknown, but could possibly be moved by water when grown in riparian areas] "The winged bean will tolerate heavy soils and poor drain age and is therefore often grown along riverbanks."

706	**Propagules bird dispersed**	**n**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Verdcourt, B., & P. Halliday. (1978). A Revision of Psophocarpus (Leguminosae-Papilionoideae-Phaseoleae). Kew Bulletin, 33(2), 191-227	"Fruits oblong to linear-oblong, (6-)8·6-26(-40) X 2-3·5 cm, with serrated wings 0·3-1 cm wide, the body of the fruit yellow-green or green, sometimes with red flecking, very rough to quite smooth in texture, the wings green to red or purple or flecked. Seeds 5-21, white, yellow, brown, black or variously mottled, subglobose, about 0·6-1 cm long, glabrous, with a small rim aril." [No evidence that the aril is attractive to birds or facilitates bird dispersal of seeds]

707	Propagules dispersed by other animals (externally)	n
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"The seeds 5–20 per pod are subglobose about 0.5–1 cm across, white, yellow, brown or black, or mottled with a small aril and non-endospermous." [Although arils are sometimes produced to facilitate dispersal by ants, there is no evidence that Psophocarpus tetragonolobus is dispersed in this manner]

708	Propagules survive passage through the gut	n
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"The whole plant as well as processed seeds is good animal feed. The cake left after extraction of oil from the seeds can be used for stock-feed." [No evidence that whole pods are consumed or seeds dispersed by livestock or other animals]

801	Prolific seed production (>1000/m2)	
	Source(s)	**Notes**
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 3 Jun 2019]	"The 1000-seed weight is about 250 g" … "Seed yield estimates from farmers' crops reach 800–1500 kg/ha; experimental yields of more than 2 t/ha have been reported," [4000 seeds/kg x 1500 kg/ha x 1 ha/10,000 m2 = 600 seeds/m2 in cultivation. Known only from cultivation, so seed densities under natural conditions unknown]

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	**Notes**
	Grubben, G.J.H. (2004). Psophocarpus tetragonolobus (L.) DC. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 3 Jun 2019]	"The seeds are very hard and can be kept for several years, but old seed requires scarification before planting. Sowing 2–3 seeds per hole can be practised on raised beds; spacings are 40–60 cm in the row and 90–100 cm between rows."

803	Well controlled by herbicides	

Qsn #	Question	Answer
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"The genus Psophocarpus contains nine species, eight of which are wild and one, winged bean is only known in cultivation." [Unknown. Cultivated only. Not subjected to mechanical control or fires under natural conditions]

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits
• Elevation range exceeds 2000 m in tropical latitudes, demonstrating environmental versatility
• Thrives in tropical climates
• Reportedly naturalized (or persisting from cultivation) in Brazil, New Zealand and possibly elsewhere (but no evidence in the Hawaiian Islands to date)
• Possibly allelopathic
• Raw seeds may be toxic
• Tolerates many soil types
• Climbing and potentially smothering growth habit
• Tuberous roots (may allow plants to persist and regrow after damage or removal of above-ground vegetation)
• Reproduces by seeds
• Self-fertile
• Perennial, but able to reach maturity in <1 growing season
• Seeds dispersed by people
• Seeds hard coated and able to be stored for several years; likely to form a persistent seed bank

Low Risk Traits
• A domesticated plant known only from cultivation
• No evidence of negative impacts due to cultivation
• Unarmed (no spines, thorns, or burrs)
• Provides fodder for livestock
• Require full sunlight (could limit ability to spread into intact forests)
• Edible to humans
• Not reported to spread vegetatively
• Relatively large pods and seeds unlikely to be inadvertently dispersed