Taxon: Derris elliptica (Wall.) Benth. **Family:** Fabaceae

Common Name(s): derris
tubaroot

Synonym(s): Cylista piscatoria Blanco
Deguelia elliptica (Benth.) Taub.
Galactia termimaliflora Blanco
Galedupa elliptica Roxb.
Millettia piscatoria Merr.
Millettia splendidissima S.Vidal
Pongamia elliptica Wall.
Pongamia volubilis Zoll. & Moritzi

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 13 Jul 2018

WRA Score: 8.0 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Tropical Liana, Toxic, Smothering, Self-Incompatible, Rarely Fruits

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
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)	High
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)	y
303	Agricultural/forestry/horticultural weed		
304	Environmental weed		
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic	y=1, n=0	n
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		

Qsn #	Question	Answer Option	Answer
405	Toxic to animals	y=1, n=0	y
406	Host for recognized pests and pathogens	y=1, n=0	n
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	y
408	Creates a fire hazard in natural ecosystems		
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	n
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		
604	Self-compatible or apomictic	y=1, n=-1	n
605	Requires specialist pollinators		
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	2
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
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	y=1, n=-1	y
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)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
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?**	**n**
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"D. elliptica may start flowering at 18 months of age. Wild plants flower and fruit normally. Pods ripen about 4 months after fertilization. In cultivation fruiting is rare." [Rarely fruits in cultivation, but no evidence found that this trait has been selected for]
	Hanelt, P. (ed.). 2001. Mansfeld's Encyclopedia of Agricultural and Horticultural Crops, Volume 2. Springer-Verlag, Berlin, Heidelberg, New York	"Several cultivars (mostly clones of this vegetatively propagated crop) are widespread in cultivation and have bean selected for high rotenone content (13% of the roots)."
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	[Cultivation history has resulted in plants with higher rotenone content] "In South-East Asia, derris is widely distributed as a wild plant, but it has also been cultivated in gardens since ancient times. This has resulted in the present situation where, on Java, for instance, wild plants vary widely but have a low rotenone content (0.5 %), whereas the cultivated plants vary little but have a high rotenone content (12-13 %). Collections of both provenances are available."

102	Has the species become naturalized where grown?	
	Source(s)	**Notes**
	WRA Specialist. 2018. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	**Notes**
	WRA Specialist. 2018. Personal Communication	NA

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**
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	"Distribution: India into Malesia, but apparently not indigenous in New Guinea as often stated."
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 13 Jul 2018]	"Native Asia-Tropical INDIAN SUBCONTINENT: Bangladesh, India, [Assam, Meghalaya, Orissa, Punjab, Tamil Nadu, West Bengal] Nepal INDO-CHINA: Cambodia, India, [Andaman and Nicobar] Laos, Myanmar, Thailand MALESIA: Malaysia, Philippines"

202	Quality of climate match data	High

Qsn #	Question	Answer
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 13 Jul 2018]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"D. elliptica is commonly found in forest edges, roadsides and along rivers, in Java up to 1500 m altitude. D. elliptica may occur as weeds in forest plantations of Acacia, Eucalyptus and Swietenia. D. elliptica can survive dry periods of up to 4 months. This species is often confined to low altitudes. BIOPHYSICAL LIMITS Altitude: Up to 1500 m." [Tropical climate but elevation range >1000m, demonstrating environmental versatility]

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	"Distribution: India into Malesia, but apparently not indigenous in New Guinea as often stated (Verdcourt, 1979, cited above), now introduced into many tropical areas as a fish poison and a potential insecticide and often naturalized."
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 13 Jul 2018]	"Native Asia-Tropical INDIAN SUBCONTINENT: Bangladesh, India, [Assam, Meghalaya, Orissa, Punjab, Tamil Nadu, West Bengal] Nepal INDO-CHINA: Cambodia, India, [Andaman and Nicobar] Laos, Myanmar, Thailand MALESIA: Malaysia, Philippines"

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	"Distribution: India into Malesia, but apparently not indigenous in New Guinea as often stated (Verdcourt, 1979, cited above), now introduced into many tropical areas as a fish poison and a potential insecticide and often naturalized."
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	Native: Bangladesh, Indonesia, Malaysia, Myanmar, Thailand Exotic: India, Papua New Guinea, Philippines

301	Naturalized beyond native range	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	"A liana or scrambling shrub, cultivated from near sea level to an elevation of about 400 m. and also occasionally naturalized along roadsides and on creek banks." … "now introduced into many tropical areas as a fish poison and a potential insecticide and often naturalized."
	Starr, F., Starr, K. & Loope, L. (2003). Derris elliptica. http://www.starrenvironmental.com/publications/species_reports/pdf/derris_elliptica.pdf. [Accessed 13 Jul 2018]	"In Hawai'i, it forms a dense canopy and smothers vegetation, fences, forest, pastures, and farm land. There are few locations of this aggressive invader on Maui. The full potential range is not known and it is uncertain whether this species will invade the rain forest or be restricted to the lowlands. Island wide eradication of this species is still possible and will probably only become harder with time." ... "Though known from Kaua'i, O'ahu, Maui and Hawai'i, D. elliptica remains unpublished as naturalized in the state of Hawai'i. Derris was first collected on O'ahu in 1950 by G. Pearsall (446481). It was first collected on Maui in 1974 by Fosberg (see Maui info. below). On the island of Hawai'i, we collected this species from the side of the road in Kealakekua, where it is sparingly naturalized. Derris has also been collected at Hilo (Herbst 9716) on Hawai'i, at Nanakuli (Pearsall 446481) and Kailua (Staples 1158) on O'ahu, and in the Waihea Game Reserve (Howard 20222) on Kaua'i."
	Parker, J.L. & Parsons, B. (2012). New plant records from the Big Island for 2009. Bishop Museum Occasional Papers 113: 55–63	"Poison-vine is infrequently cultivated and sparingly naturalized on the dry side of the island (much more frequent in the vicinity of Hilo). Perhaps cultivated for its use in supplying the compound rotenone, which acts as insecticide or fish poison, poison-vine tends to become naturalized wherever it is planted (Staples & Herbst 2005). This specimen was growing in an abandoned property over tall mango and jackfruit trees flowering heavily in February and March. No fruit was found though the population was visited numerous times. Material examined. HAWAI'I: South Kona distr. Hwy 11, mile marker 108, 2155655N, 196581E. Thick liana with compound leaves and leafless shoots 1–2 m long. climbing over coffee and avocado trees. Inflorescence of large purple pea-like flowers. fuzzy golden-brown hairs over buds and keel of flowers, 20 oct 2008, J. Parker & R. Parsons BIED42."

302	Garden/amenity/disturbance weed	y
	Source(s)	**Notes**
	Stuessy, T. F., & Ono, M. (Eds.). (2007). Evolution and Speciation of Island Plants. Cambridge University Press, Cambridge, UK	"As for the flora of the Bonin Islands, after a period of colonization for nearly a century, entire islands were left without human impact for 25 years after World War II. During this period many introduced weeds as well as escaped crops and trees grew widely on the islands, invading and destroying the original vegetation" [includes Derris elliptica]
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	"Derris elliptica was introduced in 1935 for trial as a potentially commercial rotenone-yielding plant for use in insecticides. However, it could become a weed of pastoral and plantation lands and therefore was declared a noxious weed in 1935." [Noxious weed of Fiji]

Qsn #	Question	Answer
	Starr, F., Starr, K. & Loope, L. (2003). Derris elliptica. http://www.starrenvironmental.com/publications/species_reports/pdf/derris_elliptica.pdf. [Accessed 13 Jul 2018]	"In Hawai'i, it forms a dense canopy and smothers vegetation, fences, forest, pastures, and farm land. There are few locations of this aggressive invader on Maui. The full potential range is not known and it is uncertain whether this species will invade the rain forest or be restricted to the lowlands. Island wide eradication of this species is still possible and will probably only become harder with time."

303	Agricultural/forestry/horticultural weed	
	Source(s)	**Notes**
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	"Derris elliptica was introduced in 1935 for trial as a potentially commercial rotenone-yielding plant for use in insecticides. However, it could become a weed of pastoral and plantation lands and therefore was declared a noxious weed in 1935." [Lists potential to become a weed of agriculture without actually reporting impacts]

304	Environmental weed	
	Source(s)	**Notes**
	Starr, F., Starr, K. & Loope, L. (2003). Derris elliptica. http://www.starrenvironmental.com/publications/species_reports/pdf/derris_elliptica.pdf. [Accessed 13 Jul 2018]	[A potential environmental weed, but evidence of impacts to natural ecosystems have not been documented to date] "In Hawai'i, it forms a dense canopy and smothers vegetation, fences, forest, pastures, and farm land. There are few locations of this aggressive invader on Maui. The full potential range is not known and it is uncertain whether this species will invade the rain forest or be restricted to the lowlands. Island wide eradication of this species is still possible and will probably only become harder with time."

305	Congeneric weed	y
	Source(s)	**Notes**
	Biswas, S. R., Choudhury, J. K., Nishat, A., & Rahman, M. M. 2007. Do invasive plants threaten the Sundarbans mangrove forest of Bangladesh?. Forest Ecology and Management, 245(1): 1-9	"Derris trifoliata, a climber, poses a threat to many regenerating tree seedlings owing to its aggressive twining and strangulating habit. This species is widely distributed throughout the mangrove forest irrespective of local ecological and environmental conditions. The dense populations of Derris trifoliata form a cover over the seedlings and saplings of Heritiera fomes, Excoecaria agallocha, Sonneratia apetala, among others. There are few additional invasives that inhibited normal growth of these mangroves...The three most harmful invasive species in the Sundarbans ecosystem are Derris trifoliata, Eichhornia crassipes and Eupetorium odoratum."

Qsn #	Question	Answer
401	**Produces spines, thorns or burrs**	**n**
	Source(s)	**Notes**
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	[No evidence] "A liana or scrambling shrub, cultivated from near sea level to an elevation of about 400 m. and also occasionally naturalized along roadsides and on creek banks. The pedicels are purplish and the petals pink; the brownish fruits, usually about 5 x 2 cm., have a wing 1-5 mm. broad along both sutures."

402	Allelopathic	n
	Source(s)	**Notes**
	Allen, O. N. & Allen, E. K. (1981). The Leguminosae, a Source Book of Characteristics, Uses, and Nodulation. The University of Wisconsin Press, Madison, Wisconsin	"D. elliptica, D. malaccensis, D. microphylla (Miq.) Val., and D. robusta have served as green manures, shade trees, and double-cropping on rubber, cacao, coffee, kapok, and tea plantations" [Apparently not allelopathic if used as manure and in cultivation with other crops]
	Fujii, Y., Parvez, S. S., Parvez, M., Ohmae, Y., & Iida, O. 2003. Screening of 239 medicinal plant species for allelopathic activity using the sandwich method. Weed Biology and Management, 3(4): 233-241	"Table 1. Screening of leaf litter of 239 medicinal plant species under different families using the sandwich method" [Derris elliptica was evaluated, but did not exhibit stronger inhibitory activity greater than the mean]

403	Parasitic	n
	Source(s)	**Notes**
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	"A liana or scrambling shrub" [Fabaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	**Notes**
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Toxins, poisonous, cattle have died after eating this plant." [Unknown if poisoning is accidental, or because of intentional browsing by cattle. Palatability unspecified]
	WRA Specialist. 2018. Personal Communication	Unknown. Most references refer to Derris root extracts but do not talk about palatability of leaves

405	Toxic to animals	y
	Source(s)	**Notes**
	Cambie, R. C. & Ash, J. (1994). Fijian Medicinal Plants. CSIRO Publishing, Clayton, Australia	"...because of its poisonous nature, it is recommended that not a drop should be swallowed. Juice from the root was used to stun fish in streams and to relieve pain caused by the barbs of poisonous fish."

Qsn #	Question	Answer
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Derris elliptica … Toxins, poisonous, cattle have died after eating this plant. … Roots emmenagogue; powdered root an insecticide. An extract of the root an ingredient of dart poison; bark used as ingredient of arrowpoison; leaves, bark and twigs of Tabernaemontana divaricata, together with Derris elliptica, components of an arrow poison. Roots, stems and seeds fish poison; white milky sap from the pounded roots used as fish-poison; fresh bark sap used as a fish poison"
	Macfarlane, D. C. (1998). Grazing livestock in the Southwest Pacific: the benefits of improved production. FAO Sub-Regional Office for the Pacific, Apia, Samoa	"Managing toxins and anti-nutritive compounds in pastures Poisoning is most likely to occur during periods of overgrazing, where the availability of quality forage to the grazing animal is inadequate. Animals are thus compelled to consume toxic plants, both indigenous and introduced. Some indigenous forest species such as Pangium edule have high cyanide contents of leaves and fruits which are deadly if consumed. The consumption of common weeds such as Lantana camara, Asclepias curassavica, Derris spp. or Indigofera spp. can also cause death or ill-thrift in the region." [Derris spp. reported to poison cattle, unknown if this includes D. elliptica]
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"Poison: D. elliptica is used as a fish poison throughout southern Asia and the Pacific. The pounded root is considered the strongest fish poison in South-East Asia. Rotenone is used in fisheries in the Philippines, Bangladesh and India to remove predatory and other undesired fish from rearing pods. An extract from the roots of D. elliptica is reported to be employed as an ingredient of arrow poison in Borneo. The powdered root of D. elliptica is widely used as an insecticide. Medicine: D. elliptica is traditionally used for antisepsis and applied to abscesses and against leprosy and itch, and sometimes as an abortifacient. In Thailand, the roots are also used as emmenagogue and the stems as a blood tonic."
	Allen, O. N. & Allen, E. K. (1981). The Leguminosae, a Source Book of Characteristics, Uses, and Nodulation. The University of Wisconsin Press, Madison, Wisconsin	"Toxicty of Derris species to man and test animals is very low (Jones et al. 1968)."

406	Host for recognized pests and pathogens	n
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"Diseases: Some fungal diseases are reported to damage planted D. elliptica: a rust (Ustilago derrides), a Gloeosporium sp. That causes the shoots tips to die, and an unidentified fungal disease that attacks cuttings in nursery beds. Pests: Pests are not serious and are easily controlled."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Pests recorded Insects: Icerya seychellarum (Seychelles scale) Fungus diseases: Corticium salmonicolor (damping off) Marasmius crinis-equi (horse hair blight)"

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

Qsn #	Question	Answer
	Cambie, R. C. & Ash, J. (1994). Fijian Medicinal Plants. CSIRO Publishing, Clayton, Australia	"A decoction of the leaves is used as a purgative. The juice of the leaves is used in the treatment of stomach-aches and to stop bleeding. The pounded root or stem is boiled with water and used as a rinse to treat toothache. However, because of its poisonous nature, it is recommended that not a drop should be swallowed."
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Toxins, poisonous, cattle have died after eating this plant. Fresh bark masticatory, as a substitute for betel nut. For itch, boil the plant, mix with coconut oil and apply as a poultice; for boils, pound young leaves with leaves of Capsicum frutescens and apply as a poultice. Roots emmenagogue; powdered root an insecticide. An extract of the root an ingredient of dart poison; bark used as ingredient of arrowpoison; leaves, bark and twigs of Tabernaemontana divaricata, together with Derris elliptica, components of an arrow poison. Roots, stems and seeds fish poison; white milky sap from the pounded roots used as fish-poison; fresh bark sap used as a fish poison; fish poisoning, pound leaves of Scyphostegia borneensis together with roots of Derris elliptica. Veterinary medicine, against parasites on the skin of cattle. Ceremonial, a small piece of bark burned in a ritual to remove a curse."

408	**Creates a fire hazard in natural ecosystems**	
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"D. elliptica is commonly found in forest edges, roadsides and along rivers, in Java up to 1500 m altitude. D. elliptica may occur as weeds in forest plantations of Acacia, Eucalyptus and Swietenia. D. elliptica can survive dry periods of up to 4 months. This species is often confined to low altitudes." [Unknown, but could potentially act as a fuel ladder, especially during dry periods]

409	**Is a shade tolerant plant at some stage of its life cycle**	**n**
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"D. elliptica is commonly found in forest edges, roadsides and along rivers, in Java up to 1500 m altitude. D. elliptica may occur as weeds in forest plantations of Acacia, Eucalyptus and Swietenia. D. elliptica can survive dry periods of up to 4 months. This species is often confined to low altitudes." [Grows on forest edges, roadsides and river banks where light levels are higher]
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	"Derris is suitable as an intercrop in young plantations of trees (for instance rubber or kapok). It needs full sunlight, however, so the main crop should not harm derris by shading it."
	Plants for a Future. (2018). Paraderris elliptica. https://pfaf.org/user/Plant.aspx?LatinName=Paraderris+elliptica. [Accessed 13 Jul 2018]	"It can grow in semi-shade (light woodland) or no shade."

410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	**y**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Allen, O. N. & Allen, E. K. (1981). The Leguminosae, a Source Book of Characteristics, Uses, and Nodulation. The University of Wisconsin Press, Madison, Wisconsin	"All species tolerate a wide range of soil conditions, from fertile loams to barren areas. Well drained soils, a well-distributed rainfall, and a tropical climate are preferable."
	Plants for a Future. (2018). Paraderris elliptica. https://pfaf.org/user/Plant.aspx?LatinName=Paraderris+elliptica. [Accessed 13 Jul 2018]	"Succeeds in most well-drained soils of at least moderate fertility [418]. Prefers a pH in the range 5.5 - 7, tolerating 4.3 - 8.6 [418]." [Synonyms Deguelia elliptica (Roxb.) Taub. Derris elliptica (Wall.) Benth]

411	Climbing or smothering growth habit	y
	Source(s)	**Notes**
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	"A liana or scrambling shrub"
	Starr, F., Starr, K. & Loope, L. (2003). Derris elliptica. http://www.starrenvironmental.com/publications/species_reports/pdf/derris_elliptica.pdf. [Accessed 13 Jul 2018]	"Derris is an aggressive vine that strangles vegetation and anything else that gets in its way as it spreads. It is capable of aggressive growth and reproduces by both seeds and vegetatively."
	Space, J.C., Waterhouse, B., Miles, J.E., Tiobech, J. & Rengulbai, K. (2003). Report to the Republic of Palau on invasive plant species of environmental concern. USDA Forest Service, Honolulu, HI	"Observed climbing over small trees and shrubs on Rota"

412	Forms dense thickets	n
	Source(s)	**Notes**
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	"A perennial, woody, evergreen, left-winding liana, sometimes over 16 m long and with alternate compound leaves."
	Starr, F., Starr, K. & Loope, L. (2003). Derris elliptica. http://www.starrenvironmental.com/publications/species_reports/pdf/derris_elliptica.pdf. [Accessed 13 Jul 2018]	"In Hawai'i, it forms a dense canopy and smothers vegetation, fences, forest, pastures, and farm land."

501	Aquatic	n
	Source(s)	**Notes**
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	"A liana or scrambling shrub, cultivated from near sea level to an elevation of about 400 m. and also occasionally naturalized along roadsides and on creek banks."

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 13 Jul 2018]	Family: Fabaceae (alt.Leguminosae) Subfamily: Faboideae Tribe: Millettieae

503	Nitrogen fixing woody plant	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	"A perennial, woody, evergreen, left-winding liana" ... "Application of fertilizers depends on the soil but nitrogen is never needed for this leguminous crop."
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 13 Jul 2018]	Family: Fabaceae (alt.Leguminosae) Subfamily: Faboideae Tribe: Millettieae

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	"A liana or scrambling shrub"

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"D. elliptica may start flowering at 18 months of age. Wild plants flower and fruit normally. Pods ripen about 4 months after fertilization. In cultivation fruiting is rare." [Reproductive failure in cultivation]

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Bailey, L. H. & Bailey, E. Z. 1976. Hortus. 3rd ed. Macmillan General Reference, NY	"D. elliptica is propagated by seeds, or the commercially important kinds are propagated by cuttings"
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	"Fruits flattened, 3-7 (-10) cm x 2-3 cm, indehiscent, with a narrow wing along the upper or both margins. Seeds 1-3, flat. Growth and development Ripe seeds cannot be stored dry without losing their viability. They germinate immediately after sowing. For commercial production, however, stem cuttings are used. Fruits are rare in cultivars; some cultivars like 'Ngawi' flower very rarely; others (e.g. 'Wulung', 'Pantu') flower freely but seldom fruit. Wild plants flower and fruit normally. Pods ripen 4 months after fertilization."
	Parker, J.L. & Parsons, B. (2012). New plant records from the Big Island for 2009. Bishop Museum Occasional Papers 113: 55–63	"No fruit was found though the population was visited numerous times."
	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	"The fruits are flat, brownish, about 2" long and 0.75" wide, indehiscent, and narrowly winged down both sides. Widely introduced in Asia, the Pacific Basin, and elsewhere as a source of rotenone, D. elliptica tends to become naturalized wherever it is planted, and it threatens to do the same in Hawaii."

603	**Hybridizes naturally**	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	"Hybrids between D. elliptica and D. malaccensis have shown promising results. Breeding trials have been hampered by the almost complete self-incompatibility or cross-incompatibility of most cultivars of D. elliptica." [Unknown if able to hybridize naturally]

604	Self-compatible or apomictic	n
	Source(s)	**Notes**
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	"Breeding trials have been hampered by the almost complete self-incompatibility or cross-incompatibility of most cultivars of D. elliptica."

605	Requires specialist pollinators	
	Source(s)	**Notes**
	Roubik, D.W. 1995. Pollination of cultivated plants in the tropics. FAO Services Bulletin 118. FAO, Rome, Italy	"Appendix I … Derris elliptica … Pollinators = bee?"
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	"Inflorescences pseudoracemes, 10-20 cm long; flowers 1.5 cm long, pinkish, 2 or 3 together on top of a common peduncle, standard with a green patch between two distinct basal callosities."
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"Reproductive Biology D. elliptica may start flowering at 18 months of age. Wild plants flower and fruit normally. Pods ripen about 4 months after fertilization. In cultivation fruiting is rare." [Pollination requirements unknown, but may require specialists if rarely sets seed in cultivation]

606	Reproduction by vegetative fragmentation	y
	Source(s)	**Notes**
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	"Derris is propagated vegetatively by woody stem cuttings 30-45 cm long, 0.5-1.5 cm in diameter and with 3 or more buds."
	Starr, F., Starr, K. & Loope, L. (2003). Derris elliptica. http://www.starrenvironmental.com/publications/species_reports/pdf/derris_elliptica.pdf. [Accessed 13 Jul 2018]	"It is capable of aggressive growth and reproduces by both seeds and vegetatively." … "From the initial planting Derris spreads vegetatively twining up other vegetation eventually blanketing and converting areas. Parts of the plant can grow and it could be spread from one area to another in green waste."

607	Minimum generative time (years)	2
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"D. elliptica may start flowering at 18 months of age. Wild plants flower and fruit normally. Pods ripen about 4 months after fertilization. In cultivation fruiting is rare."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Starr, F., Starr, K. & Loope, L. (2003). Derris elliptica. http://www.starrenvironmental.com/publications/species_reports/pdf/derris_elliptica.pdf. [Accessed 13 Jul 2018]	[Potentially spread in green waste] "From the initial planting Derris spreads vegetatively twining up other vegetation eventually blanketing and converting areas. Parts of the plant can grow and it could be spread from one area to another in green waste."
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	[Spread by seed unlikely in Hawaiian Islands. Fruiting rare & relatively large seeds lack means of external attachment] "Reproduction: Flowers arranged in stalked clusters of 3 with pink petals with diameter 13-17 mm. Fruits are elliptic and flat, 3.5 to 7 cm in length. Fruits contain between 1 and 3 seeds...Reproductive Biology D. elliptica may start flowering at 18 months of age. Wild plants flower and fruit normally. Pods ripen about 4 months after fertilization. In cultivation fruiting is rare."

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	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	"At least two species of the predominantly Asian genus Derris Loureiro are infrequently cultivated in Hawai'i" ... "Widely introduced in Asia, the Pacific Basin, and elsewhere as a source of rotenone, D. elliptica tends to become naturalized wherever it is planted, and it threatens to do the same in Hawai'i."
	Hanelt, P. (ed.). 2001. Mansfeld's Encyclopedia of Agricultural and Horticultural Crops, Volume 2. Springer-Verlag, Berlin, Heidelberg, New York	"Se Asia and Malesia, often introduced and naturalized into other tropical countries, hence indigenous distribution hard to delimit exactly. Together with the following species the economically most important one of the genus, in SE Asia and the Pacific isl. frequently cultivated "

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"Reproduction: Flowers arranged in stalked clusters of 3 with pink petals with diameter 13-17 mm. Fruits are elliptic and flat, 3.5 to 7 cm in length. Fruits contain between 1 and 3 seeds...Reproductive Biology D. elliptica may start flowering at 18 months of age. Wild plants flower and fruit normally. Pods ripen about 4 months after fertilization. In cultivation fruiting is rare." [Large fruits and seeds unlikely to become contaminants]

704	Propagules adapted to wind dispersal	n
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"Reproduction: Flowers arranged in stalked clusters of 3 with pink petals with diameter 13-17 mm. Fruits are elliptic and flat, 3.5 to 7 cm in length. Fruits contain between 1 and 3 seeds...Reproductive Biology D. elliptica may start flowering at 18 months of age. Wild plants flower and fruit normally. Pods ripen about 4 months after fertilization. In cultivation fruiting is rare." [Fairly large seed pods unlikely to be dispersed by wind, or if so, for only short distances, i.e. gravity]

Qsn #	Question	Answer
705	**Propagules water dispersed**	**y**
	Source(s)	**Notes**
	Ridley, H.N. (1930). The Dispersal of Plants Throughout the World. William Clowes and Sons Ltd., London	"A good many of the plants of this order have floating pods or seeds, and a number of species are sea-dispersed, both by buoyant pods, Derris, Dalbergia, Cassia , Pongamia , and by floating seeds, Mucuna, Entada , etc."
	Dichoso, W. C. (2000). Useful plant species with toxic substance. Research Information Series on Ecosystems 12 (2): 1-15	"found abundantly in thickets along streams in secondary forests at low and medium altitude from Northern Luzon to Mindanao."
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	[Occurs in riparian habitats, suggesting water dispersal] "The plant grows at forest edges and on riversides at low altitudes in humid tropical climates, with an annual rainfall of 2000-5000 mm."

706	**Propagules bird dispersed**	**n**
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"Reproduction: Flowers arranged in stalked clusters of 3 with pink petals with diameter 13-17 mm. Fruits are elliptic and flat, 3.5 to 7 cm in length. Fruits contain between 1 and 3 seeds" [not fleshy-fruited]

707	**Propagules dispersed by other animals (externally)**	**n**
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"Reproduction: Flowers arranged in stalked clusters of 3 with pink petals with diameter 13-17 mm. Fruits are elliptic and flat, 3.5 to 7 cm in length. Fruits contain between 1 and 3 seeds...Reproductive Biology D. elliptica may start flowering at 18 months of age. Wild plants flower and fruit normally. Pods ripen about 4 months after fertilization. In cultivation fruiting is rare." [No means of external attachment]

708	**Propagules survive passage through the gut**	**n**
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"Reproduction: Flowers arranged in stalked clusters of 3 with pink petals with diameter 13-17 mm. Fruits are elliptic and flat, 3.5 to 7 cm in length. Fruits contain between 1 and 3 seeds...Reproductive Biology D. elliptica may start flowering at 18 months of age. Wild plants flower and fruit normally. Pods ripen about 4 months after fertilization. In cultivation fruiting is rare." [Large seeds unlikely to be consumed by animals; not fleshy-fruited]

801	**Prolific seed production (>1000/m2)**	**n**
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 13 Jul 2018]	"D. elliptica may start flowering at 18 months of age. Wild plants flower and fruit normally. Pods ripen about 4 months after fertilization. In cultivation fruiting is rare."

Qsn #	Question	Answer
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	"Fruits are rare in cultivars; some cultivars like 'Ngawi' flower very rarely; others (e.g. 'Wulung', 'Pantu') flower freely but seldom fruit. Wild plants flower and fruit normally. Pods ripen 4 months after fertilization."
	Parker, J.L. & Parsons, B. (2012). New plant records from the Big Island for 2009. Bishop Museum Occasional Papers 113: 55–63	"No fruit was found though the population was visited numerous times."

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	**Notes**
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	"Ripe seeds cannot be stored dry without losing their viability. They germinate immediately after sowing."

803	Well controlled by herbicides	
	Source(s)	**Notes**
	Starr, F., Starr, K. & Loope, L. (2003). Derris elliptica. http://www.starrenvironmental.com/publications/species_reports/pdf/derris_elliptica.pdf. [Accessed 13 Jul 2018]	"Chemical control: No information on chemical control was found, but the vine did die back where it had been sprayed by the road crew in Nahiku." [Herbicide effectiveness unknown]

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	**Notes**
	Westphal, E., & Jansen, P. C. M. (Eds.). (1989). Plant Resources of South-East Asia. A Selection. Pudoc/Prosea, Wageningen, Netherlands	[Possibly Yes. A woody liana would likely regrow if the main stems were cut or damaged] "A perennial, woody, evergreen, left-winding liana, sometimes over 16 m long and with alternate compound leaves." … "In small plantings, where plants are usually trellised, the tops are left in place and all the roots are removed, except for those directly under the plants. This root-pruning practice enables several harvests from the same plant. Regeneration, however, is slow."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	**Notes**
	Starr, F., Starr, K. & Loope, L. (2003). Derris elliptica. http://www.starrenvironmental.com/publications/species_reports/pdf/derris_elliptica.pdf. [Accessed 13 Jul 2018]	[Unknown] "Biological control: No information on biocontrol was found, but we did notice brown spots on the leaves."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Elevation range exceeds 1000 m, demonstrating environmental versatility
• Thrives in tropical climates
• Naturalized on Hawaii, possibly Maui (Hawaiian Islands) & elsewhere
• Aggressive, weedy liana with potential negative impacts on agriculture & the natural environment
• Other Derris species are invasive
• Toxic to animals & people
• Tolerates many soil types
• Smothers other vegetation
• Reproduces by seeds (rarely, if ever, in the Hawaiian Islands) & vegetatively
• Reaches maturity in 18 months
• Seeds, if produced, dispersed by water; intentionally cultivated by people

Low Risk Traits
• Unarmed (no spines, thorns, or burrs)
• Requires full sun (may limit spread into forest ecosystems)
• Seed set in cultivation rare or absent
• Self-Incompatible
• Lack of seed production in the Hawaiian Islands limits risk of accidental or long-distance dispersal