Taxon: Arenga undulatifolia Becc. **Family:** Arecaceae

Common Name(s): aren gelora
bangkala

Synonym(s): Arenga ambong Becc.
Saguerus undulatifolius (Becc.)
Wallichia oblongifolia (non Griff.)

Assessor: Assessor **Status:** Assessor Approved **End Date:** 26 Feb 2021

WRA Score: 3.0 **Designation:** EVALUATE **Rating:** Evaluate

Keywords: Tropical Palm, Monocarpic, Ornamental,. Suckering, Fleshy-fruited

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	?
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	n
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	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	y
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals		
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans		
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		

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	n
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets		
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		
605	Requires specialist pollinators	y=-1, n=0	n
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	>3
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	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m2)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	n
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**
	Quattrocchi, U. (2017). CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"grows in large impenetrable tufts or clumps, in primary and secondary forests, limestone mountains, in rainforest clearings, foothills, heavily harvested for its cabbage and sago" [No evidence of domestication]
	Ellison, D. & Ellison, A. (2001). Cultivated Palms of the World. UNSW Press, Sydney, Australia	No evidence

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. (2021). Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2021). 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**
	Ellison, D. & Ellison, A. (2001). Cultivated Palms of the World. UNSW Press, Sydney, Australia	"The rainforests of the Philippines, Sulawesi and Borneo are the natural habitat of this multi-stemmed, medium-sized palm."

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	Ellison, D. & Ellison, A. (2001). Cultivated Palms of the World. UNSW Press, Sydney, Australia	

Qsn #	Question	Answer
203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Dave's Garden. (2021). Aren Gelora, Batbat Palm, Wild Sago Palm - Arenga undulatifolia. https://davesgarden.com/guides/pf/go/60815/. [Accessed 25 Feb 2021]	"Hardiness: USDA Zone 11: above 4.5 °C (40 °F)"
	Squire, D. (2007). Palms and Cycads. A Complete Guide to Selecting, Growing and Propagating. Ball Publishing, Batavia, Illinois	"This moderately fast-growing palm does best in tropical and subtropical climates." ... "USA Zone 10"
	Mogea, J.P. & Siemonsma, J.S., (1996). Arenga Labill. [Internet] Record from Proseabase. Flach, M. & Rumawas, F. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org. [Accessed 25 Feb 2021]	[Elevation range exceeds 1000 m, demonstrating environmental versatility] "...Arenga undulatifolia occurs up to 1500 m ... "

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**
	Ellison, D. & Ellison, A. (2001). Cultivated Palms of the World. UNSW Press, Sydney, Australia	"The rainforests of the Philippines, Sulawesi and Borneo are the natural habitat of this multi stemmed, medium-sized palm."

205	**Does the species have a history of repeated introductions outside its natural range?**	**?**
	Source(s)	**Notes**
	Puccio, P. (2021). Arenga undulatifolia. Monaco Nature Encyclopedia. https://www.monaconatureencyclopedia.com/arenga-undulatifolia/. [Accessed 13 Aug 2014]	"It is a plant in need of ample spaces for showing its characteristics in the best way, and perhaps it is also for this reason that it is somewhat little diffused out from the places of origin, cultivable in the humid tropical and subtropical climate, with lowest temperatures usually over the 16-18 °C, even if it may stand isolated decreases of temperatures down to 0 °C for a very short time, but with detriment of the foliage."
	Dave's Garden. (2021). Aren Gelora, Batbat Palm, Wild Sago Palm - Arenga undulatifolia. https://davesgarden.com/guides/pf/go/60815/. [Accessed 25 Feb 2021]	"On Jan 12, 2004, jgregan wrote: I found this website for the 1st time tonight. I live in Cairns - North-East Australia - a very warm tropical area with rainfall averaging over 100 inches a year. I have 3 Arenga Undulatifolias growing in my front garden and they are indeed a beautiful palm." "his plant has been said to grow in the following regions: Naples, Florida Ainaloa, Hawaii Hawaiian Beaches, Hawaii Leilani Estates, Hawaii Nanawale Estates, Hawaii Pahoa, Hawaii"

301	**Naturalized beyond native range**	**n**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Chong, K.Y., Tan, H.T.W. & Corlett, R.T. 2009. A Checklist of the Total Vascular Plant Flora of Singapore: Native, Naturalized and Cultivated Species. Raffles Museum of Biodiversity Research, National University of Singapore, Singapore	"Arenga undulatifolia Becc.; shrub; exotic; cultivated only"
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

302	Garden/amenity/disturbance weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

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

304	Environmental weed	n
	Source(s)	**Notes**
	Meyer, J. Y., Lavergne, C., & Hodel, D. R. (2008). Time bombs in gardens: invasive ornamental palms in tropical islands, with emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms, 52(2): 71-83	No evidence
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

Qsn #	Question	Answer
305	**Congeneric weed**	**y**
	Source(s)	**Notes**
	BioNET-EAFRINE. (2021). Arenga pinnata (Black Sugar Palm). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Arenga_pinnata_%28Black_Sugar_Palm%29.htm. [Accessed 25 Feb 2021]	"Arenga pinnata is capable of invading forest edges and can form dense stands that can inhibit the regeneration of native species. The raw juice and pulp are caustic."
	Binggeli, P. 2000. The East Usambaras (Tanzania) - The Pearl of Africa. Aliena 10: 14-15	"Casual observations at two other locations indicate that other species, hitherto not thought to be invading, are also spreading into natural forest including two tree species, Castilla elastica and Arenga pinnata, and a bamboo."
	Meyer, J. Y., Lavergne, C., & Hodel, D. R. (2008). Time bombs in gardens: invasive ornamental palms in tropical islands, with emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms, 52(2): 71-83	"Other naturalizing palms in botanical gardens include the Sugar palm Arenga pinnata and Aiphanes horrida in the Amani Botanic Garden located in the East Usambara Mountains of Tanzania, first established in 1902 (W. Dawson, pers. comm. 2007)."

401	Produces spines, thorns or burrs	y
	Source(s)	**Notes**
	Ellison, D. & Ellison, A. (2001). Cultivated Palms of the World. UNSW Press, Sydney, Australia	"The rainforests of the Philippines, Sulawesi and Borneo are the natural habitat of this multi-stemmed, medium-sized palm. It has a broad, mostly fibrous trunk and long-arching leaves. The leaflets have a glaucous tinge on the underside."
	Mogea, J.P. & Siemonsma, J.S., (1996). Arenga Labill. [Internet] Record from Proseabase. Flach, M. & Rumawas, F. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org. [Accessed]	[Thorny ligule] "A. undulatifolia . Medium-sized hapaxanthic tree, growing in clusters. Stem 4-8 m tall, internodes 15 cm long, 20 cm in diameter. Leaves on the stem about 10; sheath up to 50 cm long, not fibrous; ligule about 40 cm long, rather thorny; petiole 200 cm long, 8 cm in diameter"

402	Allelopathic	
	Source(s)	**Notes**
	WRA Specialist. (2021). Personal Communication	Unknown. No evidence found

403	Parasitic	n
	Source(s)	**Notes**
	Ellison, D. & Ellison, A. (2001). Cultivated Palms of the World. UNSW Press, Sydney, Australia	"The rainforests of the Philippines, Sulawesi and Borneo are the natural habitat of this multi-stemmed, medium-sized palm." [Arecaceae]

404	Unpalatable to grazing animals	
	Source(s)	**Notes**
	WRA Specialist. (2021). Personal Communication	Unknown

405	Toxic to animals	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Dave's Garden. (2021). Aren Gelora, Batbat Palm, Wild Sago Palm - Arenga undulatifolia. https://davesgarden.com/guides/pf/go/60815/. [Accessed 25 Feb 2021]	[Possibly toxic. Needs confirmation in scientific literature] "Danger: Seed is poisonous if ingested"
	Quattrocchi, U. (2017). CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Possibly, although eaten by palm civets] "Fruits considered poisonous, although the cooked fruits used as animal feed. Mesocarp fleshy with highly irritant crystals." … "Seeds dispersed by common palm civets Paradoxurus hermaphroditus (Carnivora, Feliformia, Viverridae)"
	Wagstaff, D.J. (2008). International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	CABI. (2021). Arenga undulatifolia. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Host of (source - data mining): Raoiella indica (red palm mite)"

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	**Notes**
	Dave's Garden. (2021). Aren Gelora, Batbat Palm, Wild Sago Palm - Arenga undulatifolia. https://davesgarden.com/guides/pf/go/60815/. [Accessed 26 Feb 2021]	"Danger: Seed is poisonous if ingested"
	Martin, G.J., Lee Agama, A., Beaman, J.H & Nais, J. (2002). Projek Etnobotani Kinabalu. The making of a Dusun Ethnoflora (Sabah, Malaysia). People and Plants working paper 9. UNESCO, Paris	[Fruit poisonous] "The fruits are considered poisonous, although in Sayap the cooked fruits are used as animal feed."
	Crevello, S. 2010. Community-Based Forest Management in Kalimantan, Indonesia: A Stocktaking of Lessons Learned. USAID/Office of Acquisition and Assistance, Washington, DC	[No evidence] "Another important plant for the people of Sungai Utik is the Aren or Enau (Arenga undulatifolia). This species of palm tree produces a sweet liquid sap that is tapped at the flower's stem. Boiling this sap produces a red sugar. The sap can also be fermented to create an alcoholic beverage called Tuak. Most of the Enau palms are found close to the long houses (rumah panjang), or in the Tembawai areas. However there is no estimate of the number of Enau trees in the area. If cultivated on a much larger scale, the sap of the Enau tree could also possibly be used to produce bioethanol, which could be used to fuel boat engines and electric generators."
	Barton, H. 2005. The case for rainforest foragers: the starch record at Niah Cave, Sarawak. Asian Perspectives, 44(1): 56-72	[Pith is edible] "Removing the starchy pith of sago palms such as Eugeissona utilis, Arenga undulatifolia, and Caryota mitis is a labor-intensive exercise and may have required hafted tools, but energetic yields are extremely high (Ulijaszek and Porairuk 1993)."
	Quattrocchi, U. (2017). CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Possibly, if fruits are consumed] "Fruits considered poisonous, although the cooked fruits used as animal feed. Mesocarp fleshy with highly irritant crystals."

Qsn #	Question	Answer
	Tropical Plants Database, Ken Fern. (2021). Arenga undulatifolia. http://tropical.theferns.info/viewtropical.php?id=Arenga+undulatifolia. [Accessed 26 Feb 2021]	[Possibly] "The apical bud (known as a 'palm heart') of all the species in this genus is edible and is used as a vegetable[310, 763]. However, consuming large quantities of the buds is not advised since, in some species (especially Arenga tremula) they can provoke toxic effects [310]. Harvesting the apical bud also leads to the death of the individual stem, since it is unable to produce side shoot [K]."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	**Notes**
	Riffle, R.L.& Craft, P. 2003. An Encyclopedia of Cultivated Palms. Timber Press, Portland, OR.	[No evidence from native range that A. undulatifolia contributes to fire frequency or is adapted to fire prone regimens] "...found in rain forest clearings of the Philippine Islands, Borneo, and western Indonesia, where it usually grows on sloping ground in foothills. of mostly limestone mountains."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	Puccio, P. (2021). Arenga undulatifolia. Monaco Nature Encyclopedia. https://www.monaconatureencyclopedia.com/arenga-undulatifolia/. [Accessed 13 Aug 2014]	"It is to be placed in full sun, or under slight shade, on well drained soils, rich of organic substance, slightly acidic or neutral and kept constantly humid."
	PACSOA. (2013). Palms: Arenga undulatifolia. http://www.pacsoa.org.au/wiki/Arenga_undulatifolia. [Accessed 13 Aug 2014]	"Sunny, moist, but well drained position. Prefers tropical conditions."
	Dave's Garden. (2021). Aren Gelora, Batbat Palm, Wild Sago Palm - Arenga undulatifolia. https://davesgarden.com/guides/pf/go/60815/. [Accessed 13 Aug 2014]	Sun Exposure: '"Sun to Partial Shade"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	n
	Source(s)	**Notes**
	Puccio, P. (2021). Arenga undulatifolia. Monaco Nature Encyclopedia. https://www.monaconatureencyclopedia.com/arenga-undulatifolia/. [Accessed 14 Aug 2014]	"It is to be placed in full sun, or under slight shade, on well drained soils, rich of organic substance, slightly acidic or neutral and kept constantly humid."
	Queensland Government. 2012. Waterwise Plant Selector - Palm (Arenga undulatifolia). http://www.nrm.qld.gov.au/waterwise/plantselector/details.php?plant_id=524. [Accessed 14 Aug 2014]	"Soil type: Loam Other soil information: High organic matter"

Qsn #	Question	Answer
411	**Climbing or smothering growth habit**	**n**
	Source(s)	**Notes**
	Ellison, D. & Ellison, A. (2001). Cultivated Palms of the World. UNSW Press, Sydney, Australia	"The rainforests of the Philippines, Sulawesi and Borneo are the natural habitat of this multi stemmed, medium-sized palm. It has a broad, mostly fibrous trunk and long-arching leaves. The leaflets have a glaucous tinge on the underside."

412	Forms dense thickets	
	Source(s)	**Notes**
	Queensland Government. 2012. Waterwise Plant Selector - Palm (Arenga undulatifolia). http://www.nrm.qld.gov.au/waterwise/plantselector/details.php?plant_id=524. [Accessed]	"large impenetrable tufts or clumps"
	Martin, G.J., Lee Agama, A., Beaman, J.H & Nais, J. (2002). Projek Etnobotani Kinabalu. The making of a Dusun Ethnoflora (Sabah, Malaysia). People and Plants working paper 9. UNESCO, Paris	[No reports of dense thicket formation, but may form dense, impenetrable clumps] "Widespread and abundant in the lowlands of Borneo and also found in Sulawesi. Dransfield (1984b:55) suggests that this palm is the same as A. ambong, which is found in the Philippines. The species, which grows in primary and secondary forests around Kinabalu Park, is considered to be common in the forests of Takutan."

501	Aquatic	n
	Source(s)	**Notes**
	Ellison, D. & Ellison, A. (2001). Cultivated Palms of the World. UNSW Press, Sydney, Australia	"The rainforests of the Philippines, Sulawesi and Borneo are the natural habitat of this multi stemmed, medium-sized palm. It has a broad, mostly fibrous trunk and long-arching leaves. The leaflets have a glaucous tinge on the underside."

502	Grass	n
	Source(s)	**Notes**
	Ellison, D. & Ellison, A. (2001). Cultivated Palms of the World. UNSW Press, Sydney, Australia	Arecaceae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	Ellison, D. & Ellison, A. (2001). Cultivated Palms of the World. UNSW Press, Sydney, Australia	Arecaceae

Qsn #	Question	Answer
504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	PACSOA. (2013). Palms: Arenga undulatifolia. http://www.pacsoa.org.au/wiki/Arenga_undulatifolia. [Accessed 26 Feb 2021]	"A very attractive palm to about 4m tall, which forms a dense clump of lovely blue/green leaves. Leaflets have a toothed, wavy edges."

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	PACSOA. (2013). Palms: Arenga undulatifolia. http://www.pacsoa.org.au/wiki/Arenga_undulatifolia. [Accessed 26 Feb 2021]	"Widely distributed throughout Borneo, and the Philippines. "

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Squire, D. (2007). Palms and Cycads. A Complete Guide to Selecting, Growing and Propagating. Ball Publishing, Batavia, Illinois	"Not easily increased, either by seed or division. Seed is slow and reluctant to germinate; soaking seeds in water for 5-6 days before sowing increases the chances of germination. Some palm experts, however, claim germination is easy and fast."
	Ellison, D. & Ellison, A. (2001). Cultivated Palms of the World. UNSW Press, Sydney, Australia	"Seeds germinate in 3 to 6 months."

603	**Hybridizes naturally**	
	Source(s)	**Notes**
	Utami, N. (1986). Natural hybrid between Arenga pinnata and A. obtusifolia in Bogor Botanical Garden (Indonesia). Berita Biologi (Indonesia) 3: 296-299	[Unknown. Other members of the genus may be able to hybridize] "The morphology and leaf anatomy of three collections of Arenga sp. of uncertain identity, grown in the Bogor Botanical Gardens (Indonesia) are investigated and compared with those of Arenga pinnata and Arenga obtusifolia. Results showed that the characteristics of those collection oscillate between A. pinnata and A. obtusifolia. It is suggested consequently that the plants represent a natural hybrid of these two latter species."

Qsn #	Question	Answer
604	**Self-compatible or apomictic**	
	Source(s)	**Notes**
	Silberbauer-Gottsberger, I. (1990). Pollination and evolution in palms. Phyton, 30(2), 213-233	[Generalization about palms] "Self-compatibility seems to be the prevailing breeding system in palms, and different mechanisms to promote outcrossing are developed. In species with hermaphrodite flowers, self-pollination is avoided by a temporal separation of female and male phases, e. g., by protandry (Thrinax) or protogyny (Cryosophila)."
	Puccio, P. (2021). Arenga undulatifolia. Monaco Nature Encyclopedia. https://www.monaconatureencyclopedia.com/arenga-undulatifolia/. [Accessed 13 Aug 2014]	[Unknown] "...a monoecious plant, monocarpic (bearing fruit only one time during its existence), caespitose, but at times solitary, with 3-5 m tall stems, even if when in cultivation they often keep lower."

605	**Requires specialist pollinators**	**n**
	Source(s)	**Notes**
	Henderson, A. (1986). A review of pollination studies in the Palmae. The Botanical Review, 52(3): 221-259	"Dransfield and Mogea (1984) reported on the great diversity in flowering behavior of this genus. Species could be either hapaxanthic or pleonanthic. Although most Caryoteae exhibited basipetal hapaxanthy, e.g., Arenga engleri Becc. (Fig. 1), some Arenga spp. exhibited acropetal hapaxanthy. Inflorescences could be solitary or several at a node, with triads of a central pistillate flower and two lateral staminate flowers, or unisexual. Some species could be dioecious. Fisher and Moore (1977) described inflorescence morphology and development of Arenga tremula (Blanco) Becc., an hapaxanthic protandrous species with multiple inflorescences. They reported honey bees visiting the staminate flowers which smelt like coriander. They also noted that sequential maturation of flowers and inflorescences prolonged the flowering period. Start and Marshall (1976) reported that bats in west Malaysia collected pollen of Arenga spp."
	Flach, M. & Rumawas, F. (eds.). (1996). Plant resources of South-East Asia, No.9. Plants yielding non-seed carbohydrates. Backhuys Publishers, Leiden, The Netherlands	[Congener Arenga pinnata is insect-pollinated] "The flowers are presumably cross-pollinated since there is little overlap in flowering of female and male inflorescences of the same palm. Bees pollinate flowers, but small flies also swarm in large numbers around male inflorescences."

606	**Reproduction by vegetative fragmentation**	**y**
	Source(s)	**Notes**
	Dave's Garden. (2021). Aren Gelora, Batbat Palm, Wild Sago Palm - Arenga undulatifolia. https://davesgarden.com/guides/pf/go/60815/. [Accessed 26 Feb 2021]	"On Dec 7, 2003, palmbob from Acton, CA (Zone 8b) wrote: ... It is a suckering palm so it takes up a lot of room."
	Squire, D. (2007). Palms and Cycads. A Complete Guide to Selecting, Growing and Propagating. Ball Publishing, Batavia, Illinois	[Can spread from suckers, but slowly] "Trunks are usually solitary and each about 20 cm (8 in) in diameter; though it is sometimes densely clustered and clump-forming with several stems." ... "Suckers removed from a parent plant are slow to become established."

Qsn #	Question	Answer
607	**Minimum generative time (years)**	**>3**
	Source(s)	**Notes**
	Dave's Garden. (2021). Aren Gelora, Batbat Palm, Wild Sago Palm - Arenga undulatifolia. https://davesgarden.com/guides/pf/go/60815/. [Accessed 26 Feb 2021]	[Tree in cultivation has not flowered in at least 5 years. Probably reaches maturity much later] "On Dec 7, 2003, palmbob from Acton, CA (Zone 8b) wrote:" ... "Later note: this palm performs wonderfully in Hawaii, a zone 11. The best examples of it I have ever seen are from that zone. However, there is a local grower who has had one in the ground for 5 years (zone 10b) but under a lot of canopy. Whether it will survive to adulthood remains to be seen. Perhaps this palm will survive even cooler temps than we first thought."

701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	**n**
	Source(s)	**Notes**
	Riffle, R.L.& Craft, P. 2003. An Encyclopedia of Cultivated Palms. Timber Press, Portland, OR.	[Possibly, but unlikely. Small fruit & seeds lack means of external attachment] "...the fruits are brown, rounded, and 1 inch in diameter."

702	**Propagules dispersed intentionally by people**	**y**
	Source(s)	**Notes**
	Riffle, R.L.& Craft, P. 2003. An Encyclopedia of Cultivated Palms. Timber Press, Portland, OR.	[Ornamental and landscaping uses] "This species serves the same general landscape use as does A. microcarpa but is more vibrant and less somber (but no more beautiful) because of the shape of the leaflets and their silvery bottoms that lend an air of movement to a clump even in still air."

703	**Propagules likely to disperse as a produce contaminant**	**n**
	Source(s)	**Notes**
	WRA Specialist. (2021). Personal Communication	No evidence that this palm has become a seed contaminant of other produce

704	**Propagules adapted to wind dispersal**	**n**
	Source(s)	**Notes**
	Squire, D. (2007). Palms and Cycads. A Complete Guide to Selecting, Growing and Propagating. Ball Publishing, Batavia, Illinois	"Flower stalks bear greenish-white flowers, followed by round, purplish-red to brown fruits, 25 mm (1 in) wide."

Qsn #	Question	Answer
705	**Propagules water dispersed**	
	Source(s)	**Notes**
	Puccio, P. (2021). Arenga undulatifolia. Monaco Nature Encyclopedia. https://www.monaconatureencyclopedia.com/arenga-undulatifolia/. [Accessed 13 Aug 2014]	[Distribution along water courses suggests seed dispersal by water may be possible] "This plant is native to Borneo, Philippines (Palawan Island) and Indonesia (Sulawesi Island), where it grows in the pluvial forests at low and medium altitudes, mostly on the banks of the water courses."

706	**Propagules bird dispersed**	**y**
	Source(s)	**Notes**
	Squire, D. (2007). Palms and Cycads. A Complete Guide to Selecting, Growing and Propagating. Ball Publishing, Batavia, Illinois	[Fleshy-fruited. Presumably Yes] "Flower stalks bear greenish-white flowers, followed by round, purplish-red to brown fruits, 25 mm (1 in) wide."

707	**Propagules dispersed by other animals (externally)**	**n**
	Source(s)	**Notes**
	Squire, D. (2007). Palms and Cycads. A Complete Guide to Selecting, Growing and Propagating. Ball Publishing, Batavia, Illinois	[Although fruit may be carried externally, they are apparently adapted for consumption & internal dispersal] "Flower stalks bear greenish-white flowers, followed by round, purplish-red to brown fruits, 25 mm (1 in) wide."

708	**Propagules survive passage through the gut**	**y**
	Source(s)	**Notes**
	Quattrocchi, U. (2017). CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Seeds dispersed by common palm civets Paradoxurus hermaphroditus (Carnivora, Feliformia, Viverridae)"
	Squire, D. (2007). Palms and Cycads. A Complete Guide to Selecting, Growing and Propagating. Ball Publishing, Batavia, Illinois	[Fleshy-fruited. Presumably Yes] "Flower stalks bear greenish-white flowers, followed by round, purplish-red to brown fruits, 25 mm (1 in) wide."

801	**Prolific seed production (>1000/m2)**	
	Source(s)	**Notes**
	Martin, G.J., Lee Agama, A., Beaman, J.H & Nais, J. (2002). Projek Etnobotani Kinabalu. The making of a Dusun Ethnoflora (Sabah, Malaysia). People and Plants working paper 9. UNESCO, Paris	[Unknown] "A massive, clustering palm with stems growing up to 3 m." ... "The inflorescences are pendulous, the male flowers with a musty smell. The flowers are pinkish and the fruits green."

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Pillai, A. R., Riyas, C. T. & Sabu, K. K. (2020). A review on the unexplored and underutilized Arenga species in India. Current Botany 11: 226-232	"Few studies in other Arenga reported that A. obtusifolia, A. engleri, A. pinnata, A. tremula, A. microcarpa, A. undulatifolia and A. wightii broke dormancy after 83-126 days without any treatments"

Qsn #	Question	Answer
	Ellison, D. & Ellison, A. (2001). Cultivated Palms of the World. UNSW Press, Sydney, Australia	"Seeds germinate in 3 to 6 months."
	Royal Botanic Gardens Kew. (2021) Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/ . [Accessed 26 Feb 2021]	"Storage Behaviour: No data available for species. Of 1 known taxa of genus Arenga, 100.00% Recalcitrant(?)"

803	Well controlled by herbicides	
	Source(s)	**Notes**
	WRA Specialist. (2021). Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	Tolerates, or benefits from, mutilation, cultivation, or fire	n
	Source(s)	**Notes**
	Tropical Plants Database, Ken Fern. (2021). Arenga undulatifolia. http://tropical.theferns.info/viewtropical.php?id=Arenga+undulatifolia. [Accessed 26 Feb 2021]	"Harvesting the apical bud also leads to the death of the individual stem, since it is unable to produce side shoots[K]."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	**Notes**
	WRA Specialist. (2021). Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits
• Elevation range exceeds 1000 m, demonstrating environmental versatility
• Thrives in tropical climates
• Other Arenga species may be invasive
• Fruit may be toxic if consumed by humans
• Seeds presumably dispersed by birds & intentionally by people
• May spread by suckering
• Limited ecological information makes accurate risk prediction difficult

Low Risk Traits
• No reports of invasiveness or naturalization, but no evidence of widespread introduction outside native range
• Unarmed (no spines, thorns or burrs)
• Ornamental

Second Screening Results for Tree/tree-like shrubs

(A) Shade tolerant or known to form dense stands?> Uncertain. May tolerate some shade. May form dense clumps.
(B) Bird-dispersed?> Presumably dispersed by birds
(C) Life-cycle < 4 years? No. 4+ years
Outcome = Evaluate