Taxon: Kigelia africana (Lam.) Benth. **Family:** Bignoniaceae

Common Name(s): sausagetree **Synonym(s):** Crescentia pinnata Jacq.
Kigelia pinnata (Jacq.) DC.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 14 Feb 2018

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

Keywords: Tropical Tree, Toxic Fruit, Self-Incompatible, Bat-Pollinated, Animal-Dispersed

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)	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)	n
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	y=1, n=0	n
406	Host for recognized pests and pathogens	y=1, n=0	y
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
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

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	y
411	Climbing or smothering growth habit	y=1, n=0	n
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	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	>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	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	y
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	y=1, n=-1	y
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**
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	[No evidence of domestication] "Kigelia africana is of subsistence value in most parts of Africa; the fruits and bark are collected and traded locally in market places. Commercial value is attributable to industrially produced pharmaceutical products, for which fruits are harvested from naturally occurring trees, and stem bark from young cultivated trees in Zimbabwe."

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**
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 14 Feb 2018]	"Native Africa East Tropical Africa: Kenya ; Tanzania ; Uganda Northeast Tropical Africa: Chad ; Eritrea ; Ethiopia ; Sudan South Tropical Africa: Malawi ; Mozambique ; Zambia ; Zimbabwe Southern Africa: Botswana ; Namibia ; South Africa KwaZulu-Natal, Transvaal; Swaziland West Tropical Africa: Benin ; Cote D'Ivoire ; Gambia ; Ghana ; Guinea ; Liberia ; Mali ; Nigeria ; Senegal ; Sierra Leone ; Togo West-Central Tropical Africa: Burundi ; Cameroon ; Equatorial Guinea Bioko; Rwanda ; Zaire"

202	**Quality of climate match data**	**High**
	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 14 Feb 2018]	

203	**Broad climate suitability (environmental versatility)**	**y**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Bekele-Tesemma, A. 1993. Useful Trees and Shrubs for Ethiopia. Regional Soil Conservation Unit, Swedish International Development Authority, Nairobi, Kenya	"Widespread in Africa, this tree is found in wet savannah and along rivers in arid areas of Moist and Wet Kolla and Bereha agroclimatic zones in Gojam, Ilubabor, Kefa and Gamo Gofa,500–1,850 m."
	Rønne, C., & Jøker, D. (2005). Kigelia africana (Lam.) Benth. Seed Leaflet, 108: 1-2	[Elevation range of 3000 m in tropical Africa, demonstrating environmental versatility] "It occurs on sandy loams, loamy red clay soils, sometimes rocky, damp or peaty soil, from sea level up to 3000 m altitude with annual rainfall of 900- 2000 mm. It does not tolerate frost, but if young plants are protected for the first 2-3 years from cold winds in colder areas, they will survive."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Kigelia africana occurs throughout tropical Africa, particularly in the drier regions. It is also found in South Africa (Northern Provinces, Kwazulu-Natal) and Swaziland, but does not occur in Mauritania, São Tomé and Principe, or the Indian Ocean islands."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"It has been introduced as an ornamental to Cape Verde and Madagascar, as well as to Iraq, Pakistan, India, China, South-East Asia, Australia, Hawaii and Central and South America."
	Rivers, M.C. & Mark, J. 2017. Kigelia africana. The IUCN Red List of Threatened Species 2017: e.T61986013A61986016. http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T61986013A61986016.en. [Accessed 14 Feb 2018]	"Kigelia africana is found throughout tropical Africa, including South Africa and Swaziland (Grace and Davis 2002). It has been introduced to Cape Verde and Madagascar, as well as many other tropical countries."
	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	"Sausage trees are native to tropical Africa, where-along with baobab trees-they are one of the most characteristic elements of drier forests. They are also widely but sporadically cultivated throughout the world's tropics, though only occasionally in Hawai'i. In the wild the nocturnal, fetid-smelling flowers are bat-pollinated. Each flower lasts but a single night, but the elongate racemes bear many buds and bloom for weeks."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Sharma, P. K., & Kaul, M. K. (1993). Specific ethnomedicinal significance of Kigelia africana in India. Fitoterapia, 64(5): 467-468	"During recent ethnobotanical surveys, Kigelia africana (syn. K. pinnata) was found to be naturalized, though of rare occurrence, in the forest of Uttar Pradesh, Himalya. "

Qsn #	Question	Answer
	Pelser, P.B., J.F. Barcelona & D.L. Nickrent (eds.). 2011 onwards. Co's Digital Flora of the Philippines. www.philippineplants.org	"Kigelia DC. [Not native, not naturalized]"
	Tropicos.org. 2018. Missouri Botanical Garden. http://www.tropicos.org/. [Accessed 14 Feb 2018]	"Peru Checklist ... Kigelia Africana ... Status: Cultivated, Introduced" [Not recorded as naturalized]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"References: France-N-518, Global-N-85, United States of America-N-101, India-N- 976, Portugal-N-1006, Europe-N-819, Laos-N-1102, Peru-N-1293, Cuba-N-1505, India-N-1370, India-N-1790, Ecuador-N-1796, Cuba-CN-2024, Cuba-N-2055, Cuba- W-1977, Lao People's Democratic Republic-W-1977, Maldives-W-1977."
	DAISIE. 2018. Species Factsheet - Kigelia africana. http://www.europe-aliens.org/speciesFactsheet.do?speciesId=18210. [Accessed 14 Feb 2018]	Country - Madeira Status - Alien/Established Contributor - Silva Vieira, R. M. da (2002)
	Wagner, W.L., Herbst, D.R.& Lorence, D.H. 2018. Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/. [Accessed 14 Feb 2018]	No evidence to date

302	Garden/amenity/disturbance weed	n
	Source(s)	**Notes**
	Joffe, P. 2003. Kigelia africana - PlantZAfrica. SANBI. http://pza.sanbi.org/kigelia-africana. [Accessed 14 Feb 2018]	[Not a weed, but could create some problems in landscaping] "Fast-growing and frost-tender, this tree has a rather invasive root system, so keep it clear of buildings, paving, pools, etc. Position it with care - a falling fruit can severely damage a parked vehicle! "
	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**
	Bekele-Tesemma, A. 1993. Useful Trees and Shrubs for Ethiopia. Regional Soil Conservation Unit, Swedish International Development Authority, Nairobi, Kenya	"The tree does not compete with crops."
	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**
	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**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence. Kigelia somalensis designated as a Q - Quarantine Weed in Australia: "Species prohibited entry under a countries quarantine laws, either because it's not present or present and under a management program"

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[No evidence] "A wide-spreading, deciduous tree growing to 10–20 m high, with a short, squat light brown trunk and bark that becomes flaky with age. The leaves are alternate and odd pinnate with 5–9 leaflets (Plates 1–2). The leaflets are opposite, glossy, ovate to elliptic-ovate, 8–16 cm long by 3–6 cm wide, coriaceous, scabrid, entire, with acute or retuse or mucronate tip, often oblique base, prominent midrib and veins on under-surface, and strigose. The flowers are maroon red, large, up to 9 cm wide, velvety, nocturnal, with fetid odour and borne in 4–12 flowered panicles on very long, pendulous pedicels (Plates 2–3). Calyx is 2.5–3 cm long, campanulate, usually 5-toothed, or lobed; corolla tube is rather slender, broadly bell-shaped, somewhat curved, and 5-lobed. The fruit is hard, greyish-brown, scurfy, huge, oblong or oblong-cylindric, 20–100 cm in length, 8–18 cm wide, indehiscent, weighing 5–10 kg and pendant on very long peduncles (Plates 1, 2 and 4). Pulp is firm and fibrous containing numerous small seeds."

402	Allelopathic	
	Source(s)	**Notes**
	WRA Specialist. 2018. Personal Communication	Unknown. No evidence found

403	Parasitic	n
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	"A wide-spreading, deciduous tree growing to 10–20 m high, with a short, squat light brown trunk and bark that becomes flaky with age." [Bignoniaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Joffe, P. 2003. Kigelia africana - PlantZAfrica. SANBI. http://pza.sanbi.org/kigelia-africana. [Accessed 14 Feb 2018]	"Elephant and kudu occasionally browse the leaves, and baboons, monkeys, bushpigs and porcupines eat the fruit."
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	"Kigelia leaves are an important livestock fodder, and the fruits are much prized by monkeys and elepha"nts.

Qsn #	Question	Answer
	Dierenfeld, E., Du Toit, R., & Braselton, W. (1995). Nutrient Composition of Selected Browses Consumed by Black Rhinoceros (Diceros bicornis) in the Zambezi Valley, Zimbabwe. Journal of Zoo and Wildlife Medicine, 26(2), 220-230	"Table 1. Chemical composition of browses consumed by black rhinoceros (Diceros bicornis) in the Zambezi Valley, Zimbabwe." [Kigelia Africana fruit consumed]

405	Toxic to animals	n
	Source(s)	**Notes**
	Akah, P. A. (1996). Antidiarrheal activity of Kigelia africana in experimental animals. Journal of Herbs, Spices & Medicinal Plants, 4(2), 31-38	"In traditional medicine, K. africana is used to treat dysentery, rheumatism and diarrhoea, and as an abortifacient, tonic and aphrodisiac. Aqueous leaf extract of K. africana (collected from Nigeria) was screened for antidiarrhoeal activity using experimental animal models. The extract (100 or 200 mg/kg) protected rats from castor oil-induced diarrhoea and reduced faecal output. The extract also decreased the propulsive movement of the gastrointestinal contents of mice. The extract did not appreciably affect acetylcholine- or histamine-induced contractions of isolated guineapig ileum, but significantly reduced nicotine-induced contractions. The i.p. LD50 of the extract in mice was estimated as 785.65 plus or minus 24 mg/kg."
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[No evidence] "Kigelia leaves are an important livestock fodder, and the fruits are much prized by monkeys and elephants."

406	Host for recognized pests and pathogens	y
	Source(s)	**Notes**
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"A rust disease caused by Newinia kigeliae has been reported. "
	Owusu-Manu, E. (1978) Host plants of Bathycoelia thalassina (H.-S.) (Hem., Pentatomidae) in Ghana. Entomologist's Monthly Magazine, 114(1372/1375): 201-202	"In a survey in Ghana in 1973, the cacao pest Bathycoelia thalassina (H.-S.) was found feeding on 10 alternative food-plants. These included orange, cola and wild plants, of which only Kigelia africana is found on cacao farms."
	Owusu-Manu, E. (1972). Biology and control of Bathycoelia thalassina (HS) (Pentatomidae Hemiptera), a pest of cocoa in Ghana. In IV International Cocoa Research Conference, St. Augustine, Trinidad, 8-18 January, 1972. pp. 539-547	"The biology of Bathycoelia thalassina (H.-S.), an important pest of cacao in Ghana [cf. RAE/A 62, 4824, etc.] and elsewhere, were studied in Ghana in the field and in the insectary. A method used to rear the pentatomid on fruits of Kigelia africana is described."

407	Causes allergies or is otherwise toxic to humans	n
	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	"Unripe fruits poisonous; the fruit reported to be purgative and also known to induce abortion; criminal poisoning. Fruits used for treatment of wounds, leprosy; powdered dried fruit used as a dressing for ulcers, sores, rheumatism."

Qsn #	Question	Answer
408	**Creates a fire hazard in natural ecosystems**	
	Source(s)	**Notes**
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Kigelia africana occurs along watercourses, in riverine fringes, alluvial and open woodland, high rainfall savanna, shrubland, and in rain forest." [No evidence. Flammability unknown]

409	**Is a shade tolerant plant at some stage of its life cycle**	**n**
	Source(s)	**Notes**
	Joffe, P. 2003. Kigelia africana - PlantZAfrica. SANBI. http://pza.sanbi.org/kigelia-africana. [Accessed 14 Feb 2018]	"Aspect: Full Sun" ... "Plant in full sun, add lots of compost and mulch well."
	Missouri Botanical Garden. 2018. Kigelia africana. http://www.missouribotanicalgarden.org. [Accessed 14 Feb 2018]	"Sun: Full sun to part shade"

410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	**y**
	Source(s)	**Notes**
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"It occurs on loamy red clay soils, sometimes rocky, damp or peaty, from sea level up to 3000 m altitude."
	Rønne, C., & Jøker, D. (2005). Kigelia africana (Lam.) Benth. Seed Leaflet, 108: 1-2	"It occurs on sandy loams, loamy red clay soils, sometimes rocky, damp or peaty soil, from sea level up to 3000 m altitude with annual rainfall of 900- 2000 mm."
	Joffe, P. 2003. Kigelia africana - PlantZAfrica. SANBI. http://pza.sanbi.org/kigelia-africana. [Accessed 14 Feb 2018]	"Soil type: Sandy, Clay, Loam"

411	**Climbing or smothering growth habit**	**n**
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	"A wide-spreading, deciduous tree growing to 10–20 m high, with a short, squat light brown trunk and bark that becomes flaky with age."

412	**Forms dense thickets**	**n**
	Source(s)	**Notes**
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Kigelia africana occurs along watercourses, in riverine fringes, alluvial and open woodland, high rainfall savanna, shrubland, and in rain forest." [No evidence]

Qsn #	Question	Answer
	Iwu, M.M. 2014. Handbook of African Medicinal Plants, Second Edition. CRC Press, Boca Raton, FL	[No evidence] "Kigelia is widely distributed throughout tropical Africa, particularly in the drier regions. It is a very resilient plant."
	Bekele-Tesemma, A. 1993. Useful Trees and Shrubs for Ethiopia. Regional Soil Conservation Unit, Swedish International Development Authority, Nairobi, Kenya	[No evidence] "Widespread in Africa, this tree is found in wet savannah and along rivers in arid areas of Moist and Wet Kolla and Bereha agroclimatic zones in Gojam, Ilubabor, Kefa and Gamo Gofa, 500–1,850 m."
	White, F. (1983). The Vegetation of Africa. Unesco, Paris	No evidence

501	Aquatic	n
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Terrestrial] "Kigelia africana is a tropical species. It is found on riverbanks, along streams, on floodplains, in open woodland, wet savannah and coastal areas from sea level to 1,200 m altitude."

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 14 Feb 2018]	Bignoniaceae

503	Nitrogen fixing woody plant	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 14 Feb 2018]	Bignoniaceae

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**
	Rivers, M.C. & Mark, J. 2017. Kigelia africana. The IUCN Red List of Threatened Species 2017: e.T61986013A61986016. http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T61986013A61986016.en. [Accessed 14 Feb 2018]	"Kigelia africana is a large tree found across tropical Africa. This is a widespread and common species, with no known threats. It is a tree that is used for a range of different purposes, including for timber and medicinal purposes. Extracts—supplied exclusively from wild harvested material—are on the commercial market, and there are concerns that even the most well intentioned sustainable collecting initiatives might be detrimental in the long term, and monitoring is needed. It is listed here as Least Concern. "

602	Produces viable seed	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Kigelia africana is readily propagated by seed; vegetative propagation using cuttings is possible but success rates are generally low."
	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	"Sausage tree is propagated by seed."

603	Hybridizes naturally	
	Source(s)	**Notes**
	WRA Specialist. 2018. Personal Communication	Unknown. No evidence found

604	Self-compatible or apomictic	n
	Source(s)	**Notes**
	Namah, J. 2013. Do mutualisms matter? A case study of the sausage tree (Kigelia africana) in Kruger National Park, South Africa. MSc Thesis. University of Cape Town, Cape Town, South Africa	"Hand pollination experiments showed Kigelia africana to be self-incompatible. The species relies on large vertebrates for successful cross pollination. Surprisingly, this apparently bat flower is mostly pollinated by many bird species in Kruger National Park. Variation in fruitset was found to be negatively correlated with distance to nearest conspecific individual. We found that there was much less successful pollination if trees were more than 45 m apart."
	Rønne, C., & Jøker, D. (2005). Kigelia africana (Lam.) Benth. Seed Leaflet, 108: 1-2	"The tree is out-crossing."

Qsn #	Question	Answer
605	**Requires specialist pollinators**	**n**
	Source(s)	**Notes**
	Perry, E. 2001. Sausage Tree Fruits. The Drifting Seed 7(2): 9-10	"In its native Africa, the flowers are pollinated by bats, and it is theorized that the long flower stems help the bats by keeping the flowers away from the thick leaves of the canopy which might confuse the bats' sonar. In Florida these trees are usually pollinated by insects rather than bats."
	Namah, J. 2013. Do mutualisms matter? A case study of the sausage tree (Kigelia africana) in Kruger National Park, South Africa. MSc Thesis. University of Cape Town, Cape Town, South Africa	"Our study indicates that the generalist birds we observed tend to be very clumsy pollinators, almost always tearing the flowers they visit (Appendix B). In contrast, Harris and Baker (1958) observed no damage to the flowers that were visited by bats. Although K. africana is widely assumed to be a bat flower, its plant-pollinator interactions in KNP indicate a more generalized system, which is now buffered against loss and/or unavailability of a bat mutualist."
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Pollination studies suggest that the most important pollination vectors are bats. However, unlike most bat-pollinated flowers which are characteristically white or cream, the flowers of Kigelia africana are reddish to purplish; the strong unpleasant odour is likely to be the primary attractant. "
	Rønne, C., & Jøker, D. (2005). Kigelia africana (Lam.) Benth. Seed Leaflet, 108: 1-2	"Pollination studies suggest, that the most important pollination vectors are nectar eating bats and outside of its natural distribution area, fruit-setting may fail. However, the flowers are also visited by sunbirds and monkeys for nectar, which may play a role in pollination."

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	[No evidence] "Kigelia africana is readily propagated by seed; vegetative propagation using cuttings is possible but success rates are generally low. It is best grown in warm areas, due to cold intolerance. It is not frost resistant, but young plants will survive if protected for the first three years. In southern Africa it is reputedly quick-growing from seed. In other areas germination rate is poor. It is also propagated by wildings, and hardwood cuttings have been used successfully in experiments. It may be competitive to crops in arid areas where water is limiting."

607	Minimum generative time (years)	>3
	Source(s)	**Notes**
	Rønne, C., & Jøker, D. (2005). Kigelia africana (Lam.) Benth. Seed Leaflet, 108: 1-2	"The tree begins to flower at the age of 6 years."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Fruits may remain on the tree for up to 6 months. Seed is released only on decay of the fallen woody fruits, or dispersed when eaten by game and livestock. Elephant and rhinoceros are reported as seed distributors."

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Neal, M.C. 1965. In Gardens of Hawaii. Bishop Museum Press, Honolulu, HI	"cultivated as a curiosity for its strange, large, susage-shaped fruit"
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"It has been introduced as an ornamental to Cape Verde and Madagascar, as well as to Iraq, Pakistan, India, China, South-East Asia, Australia, Hawaii and Central and South America."
	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	"They are also widely but sporadically cultivated throughout the world's tropics, though only occasionally in Hawai'i." ... "Kigelia africana was introduced to the Hawaiian Islands in the 1800s; in 1917 a few specimens were growing around Honolulu but the species was uncommon. Sausage tree is too large for the average home garden and is more likely to be encountered as a free-standing specimen tree in a spacious setting such as a park, commercial landscape, school campus, or church ground. Exceptional specimens can be seen on O'ahu in Ala Moana Park and Kailua, at the University of Hawai'i Manoa campus, and on the grounds of the U.S. Coast Guard station on the way to Hawai'i Kai."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	**Notes**
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	[No evidence] "Fruits may remain on the tree for up to 6 months. Seed is released only on decay of the fallen woody fruits, or dispersed when eaten by game and livestock. Elephant and rhinoceros are reported as seed distributors."

704	Propagules adapted to wind dispersal	n
	Source(s)	**Notes**
	Bekele-Tesemma, A. 1993. Useful Trees and Shrubs for Ethiopia. Regional Soil Conservation Unit, Swedish International Development Authority, Nairobi, Kenya	"FRUIT: Large grey□green "sausages", 30–60 cm long. Hanging stalks remain on the tree. Several kilos of fibrous pulp contain the seeds—only released when fruit rots on the ground."

705	Propagules water dispersed	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Perry, E. 2001. Sausage Tree Fruits. The Drifting Seed 7(2): 9-10	"In September of 2000 when I found my first sausage tree fruit, Kigelia pinnata (Bignonia family), on a Brevard County beach, I had no idea how rare of a find it was." ... "My first of two records was found along a beach near Patrick Air Force Base in the heart of Brevard County, Florida." ... "This sausage was the smaller of the two finds, 9 cm long by 8 cm wide, and appeared to have been desiccated before it began its floating journey." ... "The maximum flotation of these fruits has yet to be tested. It is likely that the existing stranding records for temperate Florida originated from south Florida locales." ... "Fruits that are found on the beach in a still fleshy condition should be dried thoroughly for several months before being added into a permanent form of storage. They will shrink in size and weight and become similar to a loofa sponge upon complete dessication."
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Kigelia africana occurs along watercourses, in riverine fringes, alluvial and open woodland, high rainfall savanna, shrubland, and in rain forest." [Occurrence along watercourses likely facilitates dispersal of seeds by water. Fruit are buoyant]

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	Bekele-Tesemma, A. 1993. Useful Trees and Shrubs for Ethiopia. Regional Soil Conservation Unit, Swedish International Development Authority, Nairobi, Kenya	"FRUIT: Large grey□green "sausages", 30–60 cm long. Hanging stalks remain on the tree. Several kilos of fibrous pulp contain the seeds—only released when fruit rots on the ground."
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Seed is released only on decay of the fallen woody fruits, or dispersed when eaten by game and livestock. Elephant and rhinoceros are reported as seed distributors."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	**Notes**
	Namah, J. 2013. Do mutualisms matter? A case study of the sausage tree (Kigelia africana) in Kruger National Park, South Africa. MSc Thesis. University of Cape Town, Cape Town, South Africa	"Despite analyzing an average of 30.2 hours of video footage from the camera traps, we found no animals directly taking the fruits or seeds from the base of the trees. Nevertheless we did see elephants sniffing at the fruits though no feeding or dispersal was observed. We also noticed a baboon carrying a wrinkled fruit but not one we had placed out." [Fruit carried by baboons. Seeds are not attached externally]
	Rønne, C., & Jøker, D. (2005). Kigelia africana (Lam.) Benth. Seed Leaflet, 108: 1-2	"Fruits can remain on the tree for up to one year. Seeds are released only on decay of the fallen woody fruits, or dispersed when eaten by game and livestock. Elephant and rhinoceros are reported as seed distributors." [Dispersed internally]

708	Propagules survive passage through the gut	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Lieberman, D., Hall, J., Swaine, M., & Lieberman, M. (1979). Seed Dispersal by Baboons in the Shai Hills, Ghana. Ecology, 60(1), 65-75	"Appendix. Systematic list of fruit species germinated from baboon dung or observed to be eaten in the Shai Hills, Ghana. Parentheses denote probable contaminants" [Kigelia africana seed germinated from dung]
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Fruits may remain on the tree for up to 6 months. Seed is released only on decay of the fallen woody fruits, or dispersed when eaten by game and livestock. Elephant and rhinoceros are reported as seed distributors."
	Gonthier, D. J. (2009). Notes on seeds deposited in elephant dung at Tarangire National Park, Tanzania. African Journal of Ecology, 47(2), 252-256	"Table 1 Elephant seed rain, mean number of seeds per bolus, and frequency of boli containing at least a seed" [Includes seeds of Kigelia africana]

801	Prolific seed production (>1000/m2)	n
	Source(s)	**Notes**
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Kigelia africana is not a prolific seeder; number of viable seeds per kg fibrous fruit pulp is between 3400 and 9700."
	Bekele-Tesemma, A. 1993. Useful Trees and Shrubs for Ethiopia. Regional Soil Conservation Unit, Swedish International Development Authority, Nairobi, Kenya	"Not a prolific seeder. Poor germination rate and slow to germinate. 3,400–6,000 seed per kg."

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	**Notes**
	Grace, O.M. & Davis, S.D. 2002. Kigelia africana (Lam.) Benth. In: Oyen, L.P.A. & Lemmens, R.H.M.J. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands	"Although it is sometimes advised that seed should not be stored, dry seeds store well under cool conditions. Seed storage behaviour is orthodox; viability is maintained for more than 3 years in airtight storage at ambient temperature with 11–15% humidity. Although pre-treatment is not essential, seeds may be soaked in hot or boiling water for 1 minute prior to sowing. Seeds are pressed into seedling trays filled with pure river sand, covered with a shallow layer of sand or compost, and kept moist. Germination commences within 10–25 days."
	Bekele-Tesemma, A. 1993. Useful Trees and Shrubs for Ethiopia. Regional Soil Conservation Unit, Swedish International Development Authority, Nairobi, Kenya	"Storage: Seed should not be stored."

803	Well controlled by herbicides	
	Source(s)	**Notes**
	WRA Specialist. 2018. Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Bekele-Tesemma, A. 1993. Useful Trees and Shrubs for Ethiopia. Regional Soil Conservation Unit, Swedish International Development Authority, Nairobi, Kenya	"Management - Slow growing, Coppicing."
	Namah, J. 2013. Do mutualisms matter? A case study of the sausage tree (Kigelia africana) in Kruger National Park, South Africa. MSc Thesis. University of Cape Town, Cape Town, South Africa	[Resprout from flood damage] "Though elephants have been found to be damaging many tree species such as Sclerocarya birrea (marula trees) and Acacia nigrescens (knobthorn trees) in KNP (Whyte et al., 2003), especially by bark stripping (Jacobs & Biggs, 2002; Mapaure & Campbell, 2002), our data suggest that they do not specifically target the sausage tree in KNP. Most of the elephant damage we observed was not fresh. We noticed that flood could be much more damaging. Many canopy trees were found toppled over as a result of flooding. However, most of those trees (10 out of the 12 large trees we found toppled over) were found to be fiercely resprouting, proving that K. africana is a persistent species."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	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	[Unknown] "Kigelia africana was introduced to the Hawaiian Islands in the 1800s; in 1917 a few specimens were growing around Honolulu but the species was uncommon."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Elevation range exceeds 1000 m in native range, demonstrating environmental versatility
• Thrives in tropical climates
• Reported to be naturalized in several locations (but no evidence from Hawaiian Islands)
• Alternate hose for pathogens of cacao
• Unripe fruits are poisonous to people
• Tolerates many soil types
• Reproduces by seeds
• Seeds dispersed by frugivorous animals & intentionally by people
• Fruit buoyant & able to be dispersed by water
• Able to coppice & resprout after cutting or damage

Low Risk Traits
• No reports of invasiveness or negative impacts in introduced range (but roots considered aggressive in some situations)
• Unarmed (no spines, thorns, or burrs)
• Leaves palatable to browsing animals
• Ornamental
• Prefers full sun
• Self-incompatible
• Pollinator limitation may reduce seed set in cultivation
• Not reported to spread vegetatively
• Reaches maturity in 6+ years
• Unlikely to be inadvertently dispersed over long distances