

Taxon: Coffea arabica L.	Family: Rubiaceae
Common Name(s): Arabian coffee arabica coffee wild coffee	Synonym(s): Coffea arabica var. arabica L.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 10 May 2019
WRA Score: 9.0	Designation: H(Hawai'i)	Rating: High Risk

Keywords: Tropical Shrub, Environmental Weed, Dense Stands, Autogamous, Bird-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		
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)	y
305	Congeneric weed		
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y

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	y=1, n=0	y
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	y=1, n=-1	y
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	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/m ²)	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	y=-1, n=1	y
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
	Duke, J. A. (1983). <i>Coffea arabica</i> . Handbook of Energy Crops. https://www.hort.purdue.edu/newcrop/duke_energy/Coffea_arabica.html . [Accessed 9 May 2019]	"Despite its name, <i>C. arabica</i> originated in Ethiopia, where it grows at elevations between 1,375 to 1,830 m. It is believed to have been introduced into Arabia prior to the 15th century. It was first planted in Java in 1690, and in the early 18th century was carried to Surinam, Martinique, and Jamaica. Cultivation soon spread throughout the West Indies and Central America and favorable regions of South America. Later, it reached India and Sri Lanka. Today, nearly 90% of the world's coffee comes from this species (Morton, 1977)."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2019). 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. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 9 May 2019]	"Native Africa NORTHEAST TROPICAL AFRICA: Ethiopia (s.w.), Sudan (s.e.) EAST TROPICAL AFRICA: Kenya (n.e.)"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 9 May 2019]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes

Qsn #	Question	Answer
	Duke, J. A. (1983). <i>Coffea arabica</i> . Handbook of Energy Crops. https://www.hort.purdue.edu/newcrop/duke_energy/Coffea_arabica.html . [Accessed 9 May 2019]	"Despite its name, <i>C. arabica</i> originated in Ethiopia, where it grows at elevations between 1,375 to 1,830 m." ... "Ranging from Warm Temperate Dry to Rain (with little or no frost) through Tropical Very Dry to Wet Forest Life Zones, coffee is reported to tolerate annual precipitation of 4.8 to 42.9 dm (mean of 109 cases = 15.8), annual temperature of 16.0 to 28.5°C (mean of 108 cases = 24.8), and pH of 4.3 to 8.4 (mean of 45 cases = 6.4) (Duke, 1978, 1979). Arabica coffee thrives from the humid tropics to temperate climates from 5°N lat. to 34°S lat. where temperatures average 11-26.5°C, and from sealevel to 2,500 m altitude. Rainfall needs to be regular, abundant, and well-distributed, from 800-2,500 mm. Ideal conditions at the equator are 1500-1800 mm."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i widely cultivated and well naturalized by the mid-1800s primarily in mesic to wet, disturbed sites, usually valleys or along streambeds, often locally abundant, 30-580 m, documented from all of the main islands except Ni'ihau."
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 9 May 2019]	"Native Africa NORTHEAST TROPICAL AFRICA: Ethiopia (s.w.), Sudan (s.e.) EAST TROPICAL AFRICA: Kenya (n.e.)"

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	" <i>Coffea arabica</i> is the most widely cultivated species of <i>Coffea</i> and the only tetraploid species (2x = 44) in the genus." ... "Main areas of cultivation are Brazil, Colombia, Mexico, Ethiopia, El Salvador, Costa Rica, Honduras, Indonesia, Guatemala, Ivory Coast, Angola, Jamaica, Uganda, India, Philippines, Cameroon and Vietnam. It is also cultivated in Angola, Cambodia, China Puerto Rico, the Virgin Islands, Papua New Guinea, Guam, Samoa and Australia."
	Wiersema, J.H. & León, B. (2013). World Economic Plants: A Standard Reference. Second Edition. CRC Press, Boca Raton, FL	"DIST: native: N.E. Trop. Afr., E. Trop. Afr. natzd. : sometimes natzd. in tropics cult.: widely cult. in tropics"
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Probably native to Ethiopia , long cultivated throughout tropical regions of the world"

301	Naturalized beyond native range	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i widely cultivated and well naturalized by the mid-1800s primarily in mesic to wet, disturbed sites, usually valleys or along streambeds, often locally abundant, 30-580 m, documented from all of the main islands except Ni'ihau."

Qsn #	Question	Answer
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 9 May 2019]	"Naturalized Africa"

302	Garden/amenity/disturbance weed	
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[A weed of disturbed forests that may pose a threat to certain endangered plants. See 3.04] "in Hawai'i widely cultivated and well naturalized by the mid-1800s primarily in mesic to wet, disturbed sites, usually valleys or along streambeds, often locally abundant, 30 -580 m,"

303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Coffee is still commercially cultivated in Hawai'i" [valued as a crop]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

304	Environmental weed	y
	Source(s)	Notes
	Queensland Government. (2019). Weeds of Australia. <i>Coffea arabica</i> . http://keyserver.lucidcentral.org . [Accessed 10 May 2019]	"Coffee (<i>Coffea arabica</i>) is regarded as an environmental weed in south-eastern Queensland and northern Queensland. It is also seen as a potential environmental weed or "sleepers weed" in northern New South Wales and other parts of coastal Queensland. In south-eastern Queensland it appears on the list of the 200 most invasive plant species, while in northern Queensland it has invaded undisturbed rainforest and rainforest margins on the Atherton Tableland. This shade-tolerant species is considered to be particularly invasive because it will grow under intact forest canopies. It has often escaped from cultivation and invaded rainforests in the tropical and sub-tropical regions of the world. In Hawaii, coffee (<i>Coffea arabica</i>) also invades valleys, streambeds, and vegetation along creeks (i.e. riparian areas)."
	Oppenheimer, H., & Lorence, D. H. (2012). A new species of <i>Cyanea</i> (Campanulaceae, Lobelioideae) from Maui, Hawaiian Islands. <i>PhytoKeys</i> 13: 15–23	" <i>Cyanea kauaulaensis</i> should be considered Critically Endangered due to its limited range, low population numbers, lack of population structure and poor seedling recruitment, probable loss of most or all of its avian pollinators and dispersal agents, landslides, flooding, herbivory by alien slugs and rats, and competition with alien plants such as <i>Ageratina adenophora</i> (Sprengel) R.M. King & H. Rob., <i>Buddleia asiatica</i> Lour., <i>Coffea arabica</i> L.,..." ... "Only three individuals remained, and the habitat had been significantly degraded by dense stands of <i>Coffea arabica</i> ."

Qsn #	Question	Answer
	US Fish and Wildlife Service. (2015). Endangered and Threatened Wildlife and Plants; Endangered Status for 49 Species From the Hawaiian Islands; Proposed Rule. Federal Register Vol. 80, No. 189: 58820-58909	[<i>Coffea arabica</i> listed among weed threats to plants of lowland mesic and wet forest ecosystems] "Nonnative Plants in the Lowland Mesic Ecosystem: Nonnative plants threatening the lowland mesic ecosystem plants proposed for listing (<i>Deparia kaalaana</i> , <i>Gardenia remyi</i> , <i>Joinvillea ascendens</i> ssp. <i>ascendens</i> , <i>Kadua fluviatilis</i> , <i>K. haupuensis</i> , <i>Lepidium orbiculare</i> , <i>Microlepia strigosa</i> var. <i>mauiensis</i> , <i>Myrsine fosbergii</i> , <i>Nothocestrum latifolium</i> , <i>Ochrosia haleakalae</i> , <i>Pritchardia bakeri</i> , <i>Santalum involutum</i> , and <i>Sicyos lanceoloideus</i>) and the lowland mesic ecosystem animals proposed for listing (the orangeblack Hawaiian damselfly and the yellow faced bees <i>Hylaeus facilis</i> , <i>H. kuakea</i> , and <i>H. mana</i>) include the nonnative understory and subcanopy species ... <i>Coffea arabica</i> (coffee)" ... "Nonnative plants threatening the lowland wet ecosystem plants proposed for listing (<i>Cyanea kauaulaensis</i> , <i>Cyclosorus boydiae</i> , <i>Cyperus neokunthianus</i> , <i>Deparia kaalaana</i> , <i>Gardenia remyi</i> , <i>Kadua fluviatilis</i> , <i>Myrsine fosbergii</i> , <i>Ochrosia haleakalae</i> , <i>Phyllostegia brevidens</i> , <i>P. helleri</i> , <i>Santalum involutum</i> , <i>Schiedea diffusa</i> ssp. <i>diffusa</i> , <i>S. pubescens</i> , <i>Stenogyne kaalae</i> ssp. <i>sherffii</i> , and <i>Wikstroemia skottsbergiana</i>) include the nonnative understory and subcanopy species ... <i>Coffea arabica</i> "

305	Congeneric weed	
	Source(s)	Notes
	Staples, G.W., Imada, C.T., & Herbst, D.R. 2002. New Hawaiian plant records for 2000. Bishop Museum Occasional Papers 68: 3-18	[Not a weed in native forests] " <i>Coffea liberica</i> Hiern New naturalized record Liberian coffee plants were noted in all size classes in alien lowland forest along the Maunawili Falls trail. The slender-trunked trees were up to 20 ft tall. It can be distinguished from <i>Coffea arabica</i> (also naturalized in this area) by its larger leaves (6–14" long usually widest above the middle and with the apex rounded or obtuse and briefly tapering (3–8" long, widest near the middle, apex acuminate in <i>C. arabica</i>); and corolla lobes (5–)6–11 (vs. 5–7). Material examined. O’AHU: Maunawili Valley, Maunawili Falls trail, forming solid stands in alien lowland forest, 22 Jul 2000, C. Imada & G. Staples 2000-11."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	<i>Coffea liberica</i> listed as naturalized and/or a weed in a number of locations worldwide

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai’i Press and Bishop Museum Press, Honolulu, HI.	"Shrubs or small trees usually 2-5 m tall, nodes ± somewhat swollen. Leaves chartaceous to thin and coriaceous, glossy, elliptic to elliptic-ovate, 7-20 cm long, (2-)3.5-7 cm wide, lateral veins 9-11 pairs, these converging at the margins to form an undulate submarginal vein, glabrous, margins entire, undulate, apex long-acuminate, ± falcate, petioles 0.8-1.5 cm long, stipules ca. (3-)5- 10 mm long, persistent."

402	Allelopathic	
	Source(s)	Notes

Qsn #	Question	Answer
	Chou, C. H., & Waller, G. R. (1980). Possible allelopathic constituents of <i>Coffea arabica</i> . <i>Journal of Chemical Ecology</i> , 6(3), 643-654	[Possibly Yes] "The aqueous extracts of leaves, stems, and roots of <i>Coffea arabica</i> significantly inhibited the seed germination and radicle growth of rye grass, lettuce, and fescue. When the extracts were diluted to 1% solution, significant suppression of lettuce growth was still found and was particularly pronounced in the extract of young seedlings. The paper chromatogram of the ether fraction of an aqueous extract of coffee leaves was bioassayed with lettuce seeds and revealed a remarkable inhibition throughout the chromatogram except for the segment of Rf 0.0–0.12. Paper without spotting extract was used as a standard. The phytotoxins present in coffee tissue were identified by paper and thin-layer chromatography and mass spectrometry. The compounds include caffeine, theobromine, theophylline, paraxanthine, scopoletin, and chlorogenic, ferulic, p-coumaric, p-hydroxybenzoic, caffeic, and vanillic acids. All compounds except caffeic acid exhibited significant phytotoxicity to lettuce growth at a concentration of 100 ppm."

403	Parasitic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Shrubs or small trees usually 2-5 m tall, nodes ± somewhat swollen." [Rubiaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Duke, J. A. (1983). <i>Coffea arabica</i> . Handbook of Energy Crops. https://www.hort.purdue.edu/newcrop/duke_energy/Coffea_arabica.html . [Accessed]	"Coffee pulp and parchment used as manures and mulches, and is occasionally fed to cattle in India." [Palatability of foliage unknown]

405	Toxic to animals	n
	Source(s)	Notes
	Duke, J. A. (1983). <i>Coffea arabica</i> . Handbook of Energy Crops. https://www.hort.purdue.edu/newcrop/duke_energy/Coffea_arabica.html . [Accessed 9 May 2019]	"Coffee pulp is a valuable cattle feed, unpalatable to cattle at first."
	Quattrocchi, U. 2012. <i>CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	n
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Duke, J. A. (1983). <i>Coffea arabica</i>. Handbook of Energy Crops. https://www.hort.purdue.edu/newcrop/duke_energy/Coffea_arabica.html. [Accessed 9 May 2019]</p>	<p>[Wild coffee could act as a reservoir for pests and pathogens of commercial coffee] "Many fungi attack Arabica coffee plants, among them the following: <i>Aithaloderma longisetum</i>, <i>Armillaria mellea</i>, <i>Ascochyta tarda</i>, <i>Botrytis cinerea</i>, <i>Botryodiplodia theobromae</i>, <i>Capnodium brasiliense</i>, <i>Cephaleuros mycoidea</i>, <i>C. virescens</i>, <i>Ceratocystis fimbriata</i>, <i>Cercospora coffeicola</i>, <i>Colletotrichum coffeanum</i>, <i>C. dematium</i>, <i>C. coffaepilum</i>, <i>Corticium salmonicolor</i>, <i>C. solani</i>, <i>Curvularia prasadii</i>, <i>Cyphella heveae</i>, <i>Fomes lamoniensis</i>, <i>F. lignosus</i>, <i>Fusarium bulbigenum</i>, <i>F. coffeicola</i>, <i>F. decemcellulare</i>, <i>F. diversisporum</i>, <i>F. equiseti</i>, <i>F. graminearum</i>, <i>F. lateritium</i>, <i>F. moniliforme</i>, <i>F. oxysporum</i>, <i>F. semitectum</i>, <i>F. solani</i>, <i>F. sporotrichioides</i>, <i>F. stilboides</i>, <i>F. tumidum</i>, <i>Gloeosporium coffeanum</i>, <i>F. coffeicola</i>, <i>Glomerella cingulata</i>, <i>G. coffeicola</i>, <i>Hemileia vastatrix</i>, <i>Hymenochaete noxia</i>, <i>Irenina isertiae</i>, <i>Leptosphaeria coffeicola</i>, <i>L. coffeigena</i>, <i>Macrophomina phaseoli</i>, <i>Meliola coffeae</i>, <i>M. psychotriae</i>, <i>Mycena citricolor</i>, <i>Mycosphaerella coffeae</i>, <i>M. coffeicola</i>, <i>Myrothecium advena</i>, <i>Nectira tropica</i>, <i>Nematospora coryli</i>, <i>N. gossypii</i>, <i>Phyllosticta coffeae-arabica</i>, <i>Ph. coffeicola</i>, <i>Physarum cinereum</i>, <i>Polyporus coffeae</i>, <i>P. occidentalis</i>, <i>Rhizoctonia bataticola</i>, <i>R. lamellifera</i>, <i>R. solani</i>, <i>Rosellinia bunodes</i>, <i>Rostrella coffea</i>, <i>Sarsopodium coffearum</i>, <i>Sclerotium rolfsii</i>, <i>Scolecopeltis longispora</i>, <i>Septoria coffea</i>, <i>S. berkeleyi</i>, <i>Stilbella flavida</i>, <i>Tripospermum gardneri</i>, <i>Xylaria rhizocala</i>. <i>Pseudomonas garcae</i> is a bacterial disease, and stem pitting is caused by a virus. <i>Cuscuta</i> and <i>Loranthus</i> spp. parasitize trees in some areas. Witches' broom also occurs. Many nematodes have been found with Arabica coffee trees, including the following: <i>Achromadora longiseta</i>, <i>Aphelenchoides parietinus</i>, <i>Aphelenchus coffeae</i>, <i>Cephalobus persegnis</i>, <i>Criconemella curvata</i>, <i>Cryptonchus abnormis</i>, <i>Ditylenchus procerus</i>, <i>Dorylaimus subulatus</i>, <i>Eucephalobus filiformis</i>, <i>E. longatus</i>, <i>Helicotylenchus concavus</i>, <i>H. erythrinae</i>, <i>Ironus ignavus</i>, <i>Melioidogyne africana</i>, <i>M. coffeicola</i>, <i>M. exigua</i>, <i>M. incognita</i>, <i>Monochus gymnotolaimus</i>, <i>Paratylenchus besoekianus</i>, <i>Pratylenchus brachyurus</i>, <i>P. coffeae</i>, <i>P. pratensis</i>, <i>Radopholus similis</i>, <i>Rotylenchulus</i> sp., <i>Tricephalobus longicaudatus</i>, <i>Trichodorus</i> sp., <i>Tylenchus acutocaudatus</i>, <i>T. caudatus</i>, <i>Xiphinema basilgoodeyi</i>, <i>X. brevicolla</i>, <i>X. insignis</i>, <i>X. radcidola</i> (Golden, p.c., 1984). Many insects attack coffee plants at various stages and on various structures."</p>
	<p>Bittenbender, H. C. and Easton Smith, V. (2008). <i>Growing Coffee in Hawaii</i>. Revised Edition. College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa,</p>	<p>[Wild coffee could act as a reservoir for pests and pathogens of commercial coffee] "Volunteer seedlings (pulpapula) Occasionally farmers use pulpapula from abandoned orchards. We do not recommend this practice on the Big Island due to chance that the seedlings maybe infested with nematodes." ... "A serious disease of coffee has occurred in the Kona region in recent years, characterized by the occurrence of individual or clustered, poorly growing or stunted coffee trees. Initially, it was referred to as "transplanting decline," "replant problem," "nutritional stress," and "Kona wilt." CTAHR plant pathologists have determined that it is caused by a new species of root-knot nematode, named <i>Meloidogyne konaensis</i>. Nematode entry and feeding within roots disrupts plant growth processes and causes growth decline, so infection by them is considered a plant disease (see Schmitt 1996, Serracin et al. 1999). Root knot nematodes are the most harmful of the extremely small, parasitic roundworms known as nematodes, although the burrowing nematode, which is also found in Kona, is also a pest of coffee."</p>

Qsn #	Question	Answer
407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Duke, J. A. (1983). <i>Coffea arabica</i> . Handbook of Energy Crops. https://www.hort.purdue.edu/newcrop/duke_energy/Coffea_arabica.html . [Accessed 10 May 2019]	[Any potential toxic or allergenic properties pertain to the processing and consumption of coffee. No evidence of acute toxicity to plants themselves] "As a long term drinker of 5-10 cups of coffee a day, I do not think I do myself any favors by drinking the coffee. Still I will quote some of the alarming things I have read. Tyler (1982) cites "some evidence linking coffee and cancer of the pancreas." "...Caffeine...in large amounts produces many undesirable side effects--from nervousness and insomnia to rapid and irregular heartbeats, elevated blood sugar and cholesterol levels, excess stomach acid, and heartburn. It is definitely a teratogen in rats" (Tyler, 1982). Michael Jacobson cites numerous studies on pregnant animals and humans in which the equivalent of 3-4 daily cups of coffee caused birth defects such as cleft palate and missing bones (Washington Star, December 20, 1978). I am seeking from MMWR documentation for a rumor I heard that several people were killed in one year by colonic irrigation with coffee, more than were killed by all other herbs combined that year (excluding alcohol, cocaine, heroine, marijuana, and tobacco). In some individuals, caffeine causes nervousness, restlessness, excitement and insomnia. Patients with peptic ulcers, hypertension, and other cardiovascular and nervous disorders are usually advised by their physicians to refrain from drinking coffee. Chlorogenic acid may induce rhinitis and dermatitis in workers engaged, in roasting, sorting, or grinding coffee (Morton, 1977). Mitchell and Rook (1979) note that the role of chlorogenic acid in the respiratory symptoms were discounted. Still workers develop asthma, dermatitis, rhinitis, and urticaria. Inhalation of coffee bean dust can produce coffee worker's lung, a type of allergic alveolitis. Coffee extracts are GRAS ([[section]]182.20), but the GRAS status of caffeine ([[section]]182.1180) is being reassessed (Duke, 1984b). "
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence] "Used in Ayurveda, Unani and Sidha. Leaf decoction taken for liver problems, leaf poultice on sores. Seed decoction stimulant, febrifuge, for influenza, fever, jaundice. Root juice or root tea drunk for scorpion sting. Veterinary medicine, for retained placenta."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence. Unlikely given habitat] "in Hawai'i widely cultivated and well naturalized by the mid-1800s primarily in mesic to wet, disturbed sites, usually valleys or along streambeds"

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes

Qsn #	Question	Answer
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"Coffea arabica is shade tolerant and prefers to be grown under light shade provided by shade tree species such Albizia spp, Erythrina spp., Inga spp and Leucaena spp or grown as an understory in thinned forests."
	Duke, J. A. (1983). Coffea arabica. Handbook of Energy Crops. https://www.hort.purdue.edu/newcrop/duke_energy/Coffea_arabica.html . [Accessed 9 May 2019]	"Plants may be shaded by taller trees or left unshaded."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	n
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"Arabica coffee prefers deep, well-drained, friable, fertile loamy soils rich in organic matter and exchangeable bases in particular, potassium. It prefers soils with mildly acidic to neutral or mildly alkaline pH. It abhors heavy clays, sandy soils and is intolerant of acid soils."
	Kuit, M., Jansen, D. M., & Nguyen, V. T. (2004). Manual for Arabica cultivation. Tan Lam Agricultural Product Joint Stock Company, Cam Lo, Quang Tri	"Arabica has specific soil requirements, although it can perform well on different types of soil. Numerous examples show that it grows well on soils of volcanic origin, such as in Khe Sanh, but also on granite-based soils as found in Huong Phung. Although the type of soil is of less importance, the texture and structure are decisive for the performance of a tree. The pH should be from 4.5 to 6, but excellent plantations can also be found on neutral (pH 7) soils [2]. Soil organic matter should be from 2 to 4%. On most soils in Huong Hoa coffee can be grown successfully. However, it is important to realize that different soils require different management."
	Duke, J. A. (1983). Coffea arabica. Handbook of Energy Crops. https://www.hort.purdue.edu/newcrop/duke_energy/Coffea_arabica.html . [Accessed 9 May 2019]	"Native Ethiopian soils are deep red to brown-red lateritic loams or clay loams of volcanic origin of high to medium fertility with pH 5.3-6.6. In Brazil, similar soils are used plus red-yellow podzolic types with pH 5-7. Optimal pH has been suggested as 4.5-7.0."
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org . [Accessed 9 May 2019]	"Soil type: Savannah soils of moderate acidity to neutral or slight alkalinity are suitable. Very sandy soils and shallow soils are unsuitable for growing coffee. Soils should be deep, slightly acidic, well-drained loams. They should be rich in nutrients especially potash and with a generous supply of organic matter."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Shrubs or small trees usually 2-5 m tall, nodes ± somewhat swollen."

412	Forms dense thickets	y
	Source(s)	Notes

Qsn #	Question	Answer
	US Fish and Wildlife Service. (2015). Endangered and Threatened Wildlife and Plants; Endangered Status for 49 Species From the Hawaiian Islands; Proposed Rule. Federal Register Vol. 80, No. 189: 58820-58909	" <i>Coffea arabica</i> (Arabian coffee), a shrub or tree to 17 ft (5 m) tall, native to Ethiopia, is widely cultivated in Hawaii as a commercial crop" ... "This species is shade-tolerant, and can form dense stands in the forest understory, displacing and shading out lowland mesic and lowland wet native vegetation."
	Oppenheimer, H., & Lorence, D. H. (2012). A new species of <i>Cyanea</i> (Campanulaceae, Lobelioideae) from Maui, Hawaiian Islands. <i>PhytoKeys</i> 13: 15–23	" <i>Cyanea kauaulaensis</i> should be considered Critically Endangered due to its limited range, low population numbers, lack of population structure and poor seedling recruitment, probable loss of most or all of its avian pollinators and dispersal agents, landslides, flooding, herbivory by alien slugs and rats, and competition with alien plants such as <i>Ageratina adenophora</i> (Sprengel) R.M. King & H. Rob., <i>Buddleia asiatica</i> Lour., <i>Coffea arabica</i> L.,..." ... "Only three individuals remained, and the habitat had been significantly degraded by dense stands of <i>Coffea arabica</i> ."

501	Aquatic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Terrestrial] "Shrubs or small trees usually 2-5 m tall... primarily in mesic to wet, disturbed sites, usually valleys or along streambeds, often locally abundant, 30-580 m"

502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 9 May 2019]	Family: Rubiaceae Subfamily: Ixoroideae Tribe: Coffeae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 9 May 2019]	Family: Rubiaceae Subfamily: Ixoroideae Tribe: Coffeae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Shrubs or small trees usually 2-5 m tall, nodes ± somewhat swollen."

601	Evidence of substantial reproductive failure in native habitat	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Moat, J. et al. (2018). <i>Coffea arabica</i> . The IUCN Red List of Threatened Species 2018: e.T18289789A18539365. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T18289789A18539365.en . [Accessed 9 May 2019]	[Wild populations classified as endangered due to loss of habitat and future impacts of climate change. Currently large numbers exist] "Due to the large size of the population, the precise population numbers for indigenous <i>Coffea arabica</i> are unknown. The species is widespread in south and southwestern Ethiopia, with a smaller subpopulation in eastern South Sudan (restricted to a small area on the Boma Plateau). Estimates from Species Distribution Models (SDMs) and density data from Senbeta et al. (2014), suggest the current population is in the range of 13.5–19.5 billion mature plants (Moat et al. 2018). The population is inferred to be in decline due to loss of its natural habitat and predicted to decline in the future due to climate change (Davis et al. 2012, Moat et al. 2018)."

602	Produces viable seed	y
	Source(s)	Notes
	Duke, J. A. (1983). <i>Coffea arabica</i> . Handbook of Energy Crops. https://www.hort.purdue.edu/newcrop/duke_energy/Coffea_arabica.html . [Accessed]	"Propagation is usually by seed; however, budding, grafting, and cuttings have been used."

603	Hybridizes naturally	y
	Source(s)	Notes

Qsn #	Question	Answer
	Prakash, N. S., Combes, M. C., Somanna, N., & Lashermes, P. (2002). AFLP analysis of introgression in coffee cultivars (<i>Coffea arabica</i> L.) derived from a natural interspecific hybrid. <i>Euphytica</i> , 124(3), 265-271	"S.288 an offspring of a putative spontaneous interspecific hybrid between tetraploid <i>Coffea arabica</i> (2n = 4x = 44) and diploid <i>C. liberica</i> (2n = 2x = 22) and 17 arabica coffee introgression lines (representing F2 and F4) derived from the cross S.288 x Kent arabica were evaluated for introgression of <i>C. liberica</i> genetic material. In all, 36 AFLP primer combinations were used in the analysis. The AFLP profiles of introgressed lines were compared to five accessions each of <i>C. arabica</i> and <i>C. liberica</i> . A total of 137 polymorphic bands were scored among the 29 accessions analysed. The introgressed genotypes exhibited 102 marker bands consisting of 65 additional bands and 37 missing bands associated with introgression of <i>C. liberica</i> genetic material. <i>C. liberica</i> accessions of EA group (<i>C. liberica</i> var <i>liberica</i> of Guinean origin) seemed to be the likely progenitor in the origin of natural hybrid. Analysis of genetic relationships in the introgressed lines suggested that introgression was limited to few fragments. Segregation and wide variation in number of marker fragments in the F2 and F4 progenies were attributed to chromosome recombinations. The differences in the level of introgression between introgressed parent, F2 and F4 groups was not pronounced. Therefore the alien genetic material appeared to be fixed and there was no elimination or counter-selection over generations, from introgressed parent to F4. In <i>C. arabica</i> accessions, only 35 polymorphic bands were seen confirming the low genetic diversity. On the contrary, although representing a small amount of alien genome introgression, the Liberica-introgressed genotypes provided notable genetic diversity. Considering the fact that the diploid species of <i>Coffea</i> constitute a valuable source of genetic diversity, the potential implications of variability generated by Liberica-introgressed genotypes in <i>C. arabica</i> breeding are discussed."

604	Self-compatible or apomictic	y
	Source(s)	Notes
	Abrol, D.P. (2015). <i>Pollination Biology, Vol.1: Pests and Pollinators of Fruit Crops</i> . Springer International Publishing, Switzerland	" <i>C. arabica</i> is tetraploid and self-compatible (Free 1993). Autonomous self pollination occurs when pollen is shed from stamens on to the stigma."
	Meyer, F. G. (1965). Notes on wild <i>Coffea arabica</i> from Southwestern Ethiopia, with some historical considerations. <i>Economic Botany</i> , 19(2), 136-151	" <i>C. arabica</i> is the only known allopolyploid, autogamous species of the genus." ... "Facultative autogamy and the capacity to produce homozygous recessive mutations are well established attributes of <i>C. arabica</i> , as all coffee planters and others who have worked with the plant know. Biologically, these traits are extremely advantageous in allowing high yielding clones to be readily propagated nearly true from seed."

605	Requires specialist pollinators	n
	Source(s)	Notes

Qsn #	Question	Answer
	Abrol, D.P. (2015). Pollination Biology, Vol.1: Pests and Pollinators of Fruit Crops. Springer International Publishing, Switzerland	"The coffee flowers are white in colour and fragrant occurring in clusters of 2 to 20 in the leaf axils. Pollen is shed immediately after the flower opens, and the stigma is immediately receptive. Both nectar and pollen are attractive to many kinds of insects." ... "In several studies, honeybees have been recognized as the most important pollinating insect visiting the coffee flowers (Raw and Free 1977 ; Roubik 2002b). In Costa Rica meliponine bees were reported as important pollinators (Ricketts 2004). Philpott et al. (2006) reported the role of ants in pollination of coffee (<i>Coffea arabica</i>) agroecosystems." ... "The primary pollinators are social bees (Roubik 2002a ; Ricketts 2004 ; Veddeler et al. 2006 ; Bos et al. 2007) followed by less abundant solitary bees (Klein et al. 2003a)."

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Staples,G.W., Imada, C.T., & Herbst, D.R. 2002. New Hawaiian plant records for 2000. Bishop Museum Occasional Papers 68: 3-18	"Coffee is usually propagated by seed because the offspring are highly uniform and closely resemble the parent. It takes three or four years for seed-grown coffee to reach flowering size. If cuttings are used, they must be taken from the upright main stem of the parent plant; cuttings from horizontal branches do not develop into erect trees."
	Duke, J. A. (1983). <i>Coffea arabica</i> . Handbook of Energy Crops. https://www.hort.purdue.edu/newcrop/duke_energy/Coffea_arabica.html . [Accessed 9 May 2019]	"Propagation is usually by seed; however, budding, grafting, and cuttings have been used."

607	Minimum generative time (years)	3
	Source(s)	Notes
	Staples,G.W., Imada, C.T., & Herbst, D.R. 2002. New Hawaiian plant records for 2000. Bishop Museum Occasional Papers 68: 3-18	"It takes three or four years for seed-grown coffee to reach flowering size."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org . [Accessed 9 May 2019]	"Dispersal is mainly by birds and mammals."
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	[No means of external attachment] "Fruit a berry ovoid, ellipsoid to oblong, 10–18 mm long, green maturing to red (Plates 3 , and 4), black on drying, fleshy, usually containing two seeds. Seeds ellipsoidal, 8–12.5 mm long, flattened on one side with a medial straight or s-shaped groove and enclosed in two membranes, the outer one is called the ‘parchment’ and the inner one is called the ‘silver skin’."

702	Propagules dispersed intentionally by people	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Wiersema, J.H. & León, B. (2013). World Economic Plants: A Standard Reference. Second Edition. CRC Press, Boca Raton, FL	"DIST: native: N.E. Trop. Afr., E. Trop. Afr. natzd. : sometimes natzd. in tropics cult.: widely cult. in tropics"
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Probably native to Ethiopia , long cultivated throughout tropical regions of the world"

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org . [Accessed 9 May 2019].	"Dispersal is mainly by birds and mammals."
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"Seeds ellipsoidal, 8–12.5 mm long, flattened on one side with a medial straight or s-shaped groove and enclosed in two membranes, the outer one is called the 'parchment' and the inner one is called the 'silver skin'." [No evidence. Seeds relatively large and unlikely to become a produce contaminant]

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org . [Accessed 9 May 2019].	"Dispersal is mainly by birds and mammals."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Fruit red, drying black to brown or olive brown, narrowly ovoid to ellipsoid, 1.2-1.6 cm long, 1-1.2 cm in diameter."

705	Propagules water dispersed	
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Although <i>Coffea arabica</i> is adapted for zoochory, frequent occurrence in streambeds suggests water may secondarily disperse seeds] "in Hawai'i widely cultivated and well naturalized by the mid-1800s primarily in mesic to wet, disturbed sites, usually valleys or along streambeds, often locally abundant, 30-580 m,"

706	Propagules bird dispersed	y
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org . [Accessed 9 May 2019].	"Dispersal is mainly by birds and mammals."

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Fruit red, drying black to brown or olive brown, narrowly ovoid to ellipsoid, 1.2-1.6 cm long, 1-1.2 cm in diameter."
	Senbeta, F., Denich, M., Boehmer, H. J., Woldemariam, T., Teketay, D., & Demissew, S. (2007). Wild <i>Coffea arabica</i> L. in Afromontane rainforests of Ethiopia: distribution, ecology and conservation. SINET: Ethiopian Journal of Science, 30(1), 13-24	"Local evidence suggests that baboons and birds (mainly hornbills) are very important dispersal agents for coffee. Coffee fruits have a sweet fleshy pulp that can be used as food by different animals and humans. During the fieldwork, a large number of birds and baboons were observed in the coffee canopy. However, many more animal species are probably involved in the dispersal processes."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Hays, B. R., Sperry, J., Drake, D. R., & Hruska, A. M. (2018). Husking Stations Provide Insight into Diet of Nonnative Rodents on O 'ahu, Hawai 'i. Pacific Science, 72(3), 335-345	[In rare instances, <i>Coffea arabica</i> seeds, depredated by rodents, may occasionally be dispersed to husking stations and could potentially germinate if not consumed] "Although intact seeds were found in 29 of the 59 husking stations, seedling establishment appeared to be rare; seedlings were found in only two stations. In both instances the species was <i>Coffea arabica</i> , which in one case was also common in the nearby vegetation."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org . [Accessed 9 May 2019].	"Dispersal is mainly by birds and mammals."
	Mudappa, D., Kumar, A., & Chellam, R. (2010). Diet and fruit choice of the brown palm civet <i>Paradoxurus jerdoni</i> , a viverrid endemic to the Western Ghats rainforest, India. Tropical Conservation Science, 3(3), 282-300	"Fruits of four species of exotic, introduced, or domesticated plants (banana <i>Ensete paradisiaca</i> , cardamom <i>Elettaria cardamomum</i> , coffee <i>Coffea arabica</i> , and guava <i>Psidium guajava</i>) were also consumed. When exotic fruits were also included, 97.04% of scats contained fruit remains (primarily seeds)." ... "Another important aspect is that the brown palm civet also consumes and disperses seeds of alien (exotic) species such as coffee (<i>Coffea</i> sp.), which may play a partial role in the spread of this understory species in relatively undisturbed forests adjacent to coffee plantations [59]."

801	Prolific seed production (>1000/m2)	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Fruit drupaceous, pyrenes thin or thick-walled, grooved on the flat side. Seeds 1 per pyrene." [No evidence. 1-seeded fruit with relatively large seeds]

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	Notes

Qsn #	Question	Answer
	Santana Buzzy, N., et al. (2002). The effect of in vitro germination in maintaining germination levels over time in storage for two cultivars of <i>Coffea arabica L.</i> Seed Science and Technology 30(1): 119-129	a sharp decrease in germination percentage (100-25%) in a greenhouse after a few months of seed storage.

803	Well controlled by herbicides	y
	Source(s)	Notes
	Nelson, S. (2008). Glyphosate Herbicide Injury to Coffee. PD-56. UH-CTAHR, Honolulu. https://www.ctahr.hawaii.edu/oc/freepubs . [Accessed 10 May 2019]	"The principal negative effects of glyphosate injury to coffee plants include stunting and arrested growth of plants, nutritional deficiency symptoms (foliar yellowing), poor coffee bean yields, and predisposition to other diseases such as <i>Cercospora</i> leaf spot and berry blotch. Banana moth injury to coffee verticals after pruning, and root rots in wet soils after severe coffee pruning, also cause plant damage and slow re-growth of new vertical branches."
	Gustine Lee, J., Beachy, J. & Leary, J. 2015. Efficacy of Undiluted Herbicide Injections on Tropical Woody Tree Species in Hawaii. Poster Presentation. Ecology and Management of Alien Plant Invasions 13th International Conference, September 20-24, 2015, Kona, HI	"The treatment technique, Incision Point Application (IPA), involves making discrete, regularly spaced cuts around the trunk of a tree, and applying a measured amount of undiluted herbicide to each cut. Treated trees were monitored for up to two years. Performance was measured by recording defoliation and cambium health over time. Surprisingly, triclopyr was the least effective product tested. Imazapyr exhibited the greatest success, providing the most effective control across the greatest number of species. Using the results of these trials, OANRP has begun controlling canopy weeds across large acreages." [<i>Coffea arabica</i> was effectively controlled using Imazapyr]

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Kuit, M., Jansen, D. M., & Nguyen, V. T. (2004). Manual for Arabica cultivation. Tan Lam Agricultural Product Joint Stock Company, Cam Lo, Quang Tri	[Entire plant cant be cut to a stump, and will regenerate] "With direct stumping the entire stem is removed in one time. Again the stem should be cut at an angle of 45 degrees for the reasons mentioned in the previous section. The cut should be made around 10 to 15cm above the soil (Figure 131). Literature recommends a taller stump, but in Huong Hoa the seasonal winds from Laos result in too many broken sucker if the stump is taller. Stumping closer to the soil than this can result in increased infections by fungus and bacteria of the stump and a general reduction of regenerative capacity"

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes

Qsn #	Question	Answer
	<p>CTAHR. (2019). Coffee Berry Borer (<i>Hypothenemus hampei</i>). https://www.ctahr.hawaii.edu/site/CBBManage.aspx. [Accessed 9 May 2019]</p>	<p>[Impacts on wild populations unknown] "In August 2010, the coffee berry borer was found in South Kona, Island of Hawai'i, and its identity was confirmed by Dr. Natalia J. Vandenberg (Systematic Entomology Laboratory, USDA-ARS). The infestation in South Kona extends from north of Kainaliu to south of 'Opihiale (Hawai'i Department of Agriculture 2010)(Fig.2), which indicates that the insect has been present in the island for some time. The insect has not yet been found on any other island." ... "The coffee berry borer female (1.4-1.78 mm) attacks immature and mature coffee berries from about eight weeks after flowering up to harvest season (>32 weeks). Females bore a hole into the coffee berry (Fig. 3) and then construct galleries in the seeds (beans) where the eggs are deposited, followed by larval feeding on the coffee seed (Bustillo et al. 1998, Barrera 2008) (Fig. 4). Three types of damage have been reported: 1) premature fall of young berries, 2) increased vulnerability of infested ripe berries to fungus or bacterial infection, and 3) reduction in both yield and quality of coffee, reducing the income of coffee growers (Damon 2000, Jaramillo et al. 2006). The coffee berry borer can cause yield losses of 30-35% with 100% of berries infested at harvest time. Damage may be greater if harvest is delayed (Barrera 2008)."</p>

Summary of Risk Traits:

High Risk / Undesirable Traits

- Broad climate suitability (elevation range exceeds 1000 m in native range)
- Thrives in tropical climates
- Naturalized on all of the main Hawaiian islands except Ni'ihau; widely cultivated and naturalized elsewhere
- Wild coffee is an environmental weed in Australia, and the Hawaiian Islands, where it threatens several native, endangered plant species
- Aqueous extracts of leaves, stems, and roots exhibit allelopathic properties
- Wild coffee may host pests and pathogens of commercial coffee, and other plants
- Shade tolerant
- Forms dense stands that exclude other vegetation
- Reproduces by seeds
- Hybridizes with *Coffea liberica*
- Autogamous and self-compatible
- Reaches maturity in 3-4 years
- Seeds dispersed by birds, mammals, and intentionally cultivated by people
- Occurrence along streams suggests water may also disperse seeds
- Able to resprout from a cut stump without herbicide treatment

Low Risk Traits

- Commercial coffee is an important economic crop. Active cultivation and management can minimize risk of invasiveness
- Unarmed (no spines, thorns, or burrs)
- Not reported to spread vegetatively
- Seeds reported to lose viability quickly if not stored properly