

<b>Taxon:</b> <i>Theobroma bicolor</i> Humb. & Bonpl.	<b>Family:</b> Sterculiaceae
<b>Common Name(s):</b> macambo patashte Peruvian cacao tiger cocoa	<b>Synonym(s):</b> Cacao bicolor (Humb. & Bonpl.) Poir

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Assessor Approved	<b>End Date:</b> 3 Oct 2016
<b>WRA Score:</b> 0.0	<b>Designation:</b> L	<b>Rating:</b> Low Risk

**Keywords:** Tropical Tree, Edible Fruit, Edible Seeds, Shade-Tolerant, Slow-growing

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	n
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		
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		
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

Qsn #	Question	Answer Option	Answer
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y
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		
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		
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m <sup>2</sup> )	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
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	[Cultivated, but evidence of domestication lacking] "Its origin is still uncertain. One view believed that the species is native to Central America, another believed that it is indigenous to south America. The species is found in Belize, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Guatemala, Panama, Peru and Venezuela. It also has been introduced to other tropical areas."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2016. 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, 2016. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 28 Sep 2016]	"Other: . origin probably Central America Cultivated: Northern America Southern Mexico: Mexico - Chiapas, - Oaxaca Southern America Brazil: Brazil - Amazonas, - Para Mesoamerica: Belize; Costa Rica; El Salvador; Guatemala Western South America: Bolivia; Ecuador; Peru"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 28 Sep 2016]	

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

Qsn #	Question	Answer
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	"The tree thrives in a warm, humid, tropical environment with mean annual temperatures of 25–30°C and mean annual precipitation of 2,000– >3,000 mm from near sea level up to 1,000 m elevation."
	FAO. 1986. Food and fruit-bearing forest species 3: Examples from Latin America. FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	"Where it occurs in the dense forests of Ecuador the rainfall is in excess of mm, with mean annual temperatures between 250 and 28°C. Most references indicate the altitude limit at about 1000 m, the one reference from Mexico of 1800 m is believed to be an error."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	"Its origin is still uncertain. One view believed that the species is native to Central America, another believed that it is indigenous to south America. The species is found in Belize, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Guatemala, Panama, Peru and Venezuela. It also has been introduced to other tropical areas."

205	Does the species have a history of repeated introductions outside its natural range?	?
	Source(s)	Notes
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	"It also has been introduced to other tropical areas."

301	Naturalized beyond native range	
	Source(s)	Notes
	Hanelt, P. (ed.). 2001. Mansfeld's Encyclopedia of Agricultural and Horticultural Crops, Volume 3. Springer-Verlag, Berlin, Heidelberg, New York	"rarely escaped from cultivation"
	Useful Tropical Plants Database. 2016. <i>Theobroma bicolor</i> . <a href="http://tropical.theferns.info/viewtropical.php?id=Theobroma+bicolor">http://tropical.theferns.info/viewtropical.php?id=Theobroma+bicolor</a> . [Accessed 3 Oct 2016]	"The tree is widely cultivated in Mesoamerica for its fruit[317, 335] and is rarely escaped from cultivation[317]. "
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence
	Wagner, W.L., Herbst, D.R.& Lorence, D.H. 2016. Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. <a href="http://botany.si.edu/">http://botany.si.edu/</a> . [Accessed 3 Oct 2016]	No evidence

Qsn #	Question	Answer
302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Useful Tropical Plants Database. 2016. <i>Theobroma bicolor</i> . <a href="http://tropical.theferns.info/viewtropical.php?id=Theobroma+bicolor">http://tropical.theferns.info/viewtropical.php?id=Theobroma+bicolor</a> . [Accessed 3 Oct 2016]	"The tree is widely cultivated in Mesoamerica for its fruit[317, 335] and is rarely escaped from cultivation[317]. "
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

304	Environmental weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

305	Congeneric weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	[No evidence] "An evergreen, medium-sized tree, 25–30 m, trunk grey, becoming fissured, rough, lax crown composed of a few whorls of 3 branches. Leaves alternate, simple, stipules oblong-lanceolate, petioles 1.2–2.5 cm long, lamina dimorphic, those on the main stem broadly ovate-cordate, 12–35 cm by 12–16 cm, apex acuminate, base cordate palmate venation, those on lateral branches oblong to elliptic-ovate, apex acuminate, base cordate, lamina 30–50 cm by 20–40 cm wide, on 10–40 cm long petioles, upper surface pale green, lower silvery grey tomentose, venation pinnate"

Qsn #	Question	Answer
402	<b>Allelopathic</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Morikawa, C. I. O., Miyaura, R., Tapia Y Figueroa, M. D. L., Rengifo Salgado, E. L., & Fujii, Y. 2012. Screening of 170 Peruvian plant species for allelopathic activity by using the Sandwich Method. <i>Weed Biology and Management</i> , 12 (1): 1-11	[Possibly Yes] "Table 2. Allelopathic activity of the 176 samples (170 species) of Peruvian plants by the Sandwich Method" [ <i>Theobroma bicolor</i> - stronger inhibitory activity in the radicle:* M – 1(s)]

403	Parasitic	n
	<b>Source(s)</b>	<b>Notes</b>
	Lim, T.K. (2012). <i>Edible Medicinal and Non-Medicinal Plants</i> . Volume 3, Fruits. Springer, New York	"An evergreen, medium-sized tree, 25–30 m, trunk grey, becoming fissured, rough, lax crown composed of a few whorls of 3 branches." [Malvaceae. No evidence]

404	Unpalatable to grazing animals	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. 2016. Personal Communication	Unknown

405	Toxic to animals	n
	<b>Source(s)</b>	<b>Notes</b>
	Useful Tropical Plants Database. 2016. <i>Theobroma bicolor</i> . <a href="http://tropical.theferns.info/viewtropical.php?id=Theobroma+bicolor">http://tropical.theferns.info/viewtropical.php?id=Theobroma+bicolor</a> . [Accessed 3 Oct 2016]	"Known Hazards None known"
	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	
	<b>Source(s)</b>	<b>Notes</b>
	CABI, 2016. <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	"Minor host of: <i>Sahlbergella singularis</i> (mirids)"
	Grow Plants. 2016. <i>Theobroma bicolor</i> . <a href="http://www.growplants.org/growing/theobroma-bicolor">http://www.growplants.org/growing/theobroma-bicolor</a> . [Accessed 3 Oct 2016]	"Pests and diseases in <i>Theobroma bicolor</i> : Fungal"
	FAO. 1986. <i>Food and fruit-bearing forest species 3: Examples from Latin America</i> . FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	"The patishte is susceptible to Witches Broom disease (see <i>T. cacao</i> )."

407	Causes allergies or is otherwise toxic to humans	n
	<b>Source(s)</b>	<b>Notes</b>

Qsn #	Question	Answer
	FAO. 1986. Food and fruit-bearing forest species 3: Examples from Latin America. FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	"Both the pulp surrounding the seed and the seed itself are consumed. The pulp is juicy and has a sweet agreeable flavour, better than that of <i>T. cacao</i> . The seed has a flavour inferior to that of <i>T. cacao</i> . The pulp is eaten fresh, out of hand. The seed may be cooked or toasted before eating. It also may be made into a chocolate of inferior quality, although the fat (cocoa butter) that may be extracted from the seed is of good quality. The durable pericarp may be cleaned, dried and used as a bowl or container ."
	Useful Tropical Plants Database. 2016. <i>Theobroma bicolor</i> . <a href="http://tropical.theferns.info/viewtropical.php?id=Theobroma+bicolor">http://tropical.theferns.info/viewtropical.php?id=Theobroma+bicolor</a> . [Accessed 3 Oct 2016]	"Known Hazards None known"
	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

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	[No evidence. Does not occur in fire prone habitats] "The tree thrives in a warm, humid, tropical environment with mean annual temperatures of 25–30°C and mean annual precipitation of 2,000–>3,000 mm from near sea level up to 1,000 m elevation."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	"In its native range, it occurs in both dense and open forests. It grows best in partial or full shade in well-drained clays or loamy clays."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	"It grows best in partial or full shade in well-drained clays or loamy clays."
	FAO. 1986. Food and fruit-bearing forest species 3: Examples from Latin America. FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	" <i>Theobroma bicolor</i> occurs throughout its range almost always on well-drained soils, most frequently on clay or loamy clay soils. In the central Amazon it grows well on nutrient poor oxisols, although in western Amazonia it grows better on the somewhat richer ultisols."
	Useful Tropical Plants Database. 2016. <i>Theobroma bicolor</i> . <a href="http://tropical.theferns.info/viewtropical.php?id=Theobroma+bicolor">http://tropical.theferns.info/viewtropical.php?id=Theobroma+bicolor</a> . [Accessed 3 Oct 2016]	[No evidence] "Grows best in well-drained soil [377]. Prefers a pH in the range 5 - 6, tolerating 4.5 - 8.5 [418]."

Qsn #	Question	Answer
411	<b>Climbing or smothering growth habit</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	"An evergreen, medium-sized tree, 25–30 m, trunk grey, becoming fissured, rough, lax crown composed of a few whorls of 3 branches."
412	<b>Forms dense thickets</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	FAO. 1986. Food and fruit-bearing forest species 3: Examples from Latin America. FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	"It grows in both the dense and more open forests , in the latter it occurs in densities up to 1 tree/hectare. Where it occurs in the dense forests of Ecuador the rainfall is in excess of mm, with mean annual temperatures between 250 and 28°C."
501	<b>Aquatic</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	[Terrestrial] "In its native range, it occurs in both dense and open forests. It grows best in partial or full shade in well-drained clays or loamy clays."
502	<b>Grass</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 28 Sep 2016]	Family: Malvaceae Subfamily: Byttnerioideae Tribe: Theobromateae
503	<b>Nitrogen fixing woody plant</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 28 Sep 2016]	Family: Malvaceae Subfamily: Byttnerioideae Tribe: Theobromateae
504	<b>Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	"An evergreen, medium-sized tree, 25–30 m, trunk grey, becoming fissured, rough, lax crown composed of a few whorls of 3 branches."
601	<b>Evidence of substantial reproductive failure in native habitat</b>	n
	<b>Source(s)</b>	<b>Notes</b>



Qsn #	Question	Answer
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	[No evidence] "Its origin is still uncertain. One view believed that the species is native to Central America, another believed that it is indigenous to south America. The species is found in Belize, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Guatemala, Panama, Peru and Venezuela. It also has been introduced to other tropical areas."

602	Produces viable seed	Y
	Source(s)	Notes
	FAO. 1986. Food and fruit-bearing forest species 3: Examples from Latin America. FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	"Germination is rapid and good if the seed are sown immediately after removal from the pod. In good substrate nursery growth is rapid. It requires semi-shade for the first few months. No information is available about vegetative propagation."

603	Hybridizes naturally	
	Source(s)	Notes
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	Unknown. No evidence

604	Self-compatible or apomictic	
	Source(s)	Notes
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	"Inflorescence axillary on the leafy juvenile branches. Sepals 5, lanceolate to ovate-lanceolate, petals 5 smaller oblongovate, pinkish white to reddish, stamens 5, compressed revurved filaments with bilocular anthers, ovary superior, oblong-ovate, 5-lobed, each locule with numerous ovules, styles 5 united, 1–2 mm long."

Qsn #	Question	Answer
	Ramos, A. R., Venturieri, G. A., Cuco, S. M., & Castro, N. M. (2005). The site of self-incompatibility action in cupuassu ( <i>Theobroma grandiflorum</i> ). <i>Brazilian Journal of Botany</i> , 28 (3), 569-578	[Related taxon exhibits self-incompatibility] "Cupuassu ( <i>Theobroma grandiflorum</i> (Willd. ex Spreng.) Schumann) is a fruit tree that is attracting attention in Brazil and also in other tropical countries. Its pulp is used to prepare ice cream, juices, jellies and many other home-made sweets. This species has a very low fecundity, attributed to problems with pollination and self-incompatibility, noted as being restrictive to the agronomic productivity of the species. Controlled pollinations between compatible and incompatible parents were made and flowers were collected at three times: 24, 48 and 72 h after pollinations, during the floral seasons of 1995 and 1998. In flowers collected 24 h after pollination, in both compatible and incompatible crosses, around 70% of ovules showed egg apparatus without evidences of sperm cell delivery; nevertheless some pollen tubes had been observed. Ovaries collected at 48 h showed different behaviors according to the type of cross. In the compatibles, 35% of ovules did not show evidences of gamete fusion. In incompatible crosses this number rose to 50%. Collected ovaries with 72 h, from compatible and incompatible crosses, showed respectively 1.2% and 14.2% of the ovules with the egg apparatus and polar nuclei only. In these ovaries, for the two types of crosses, the presence of sperm nuclei was common and the zygote was still undivided. The incompatibility action is occurring after fertilization, in a late self-incompatibility action."
	Souza, M. S., & Venturieri, G. A. (2010). Floral biology of cacauihy ( <i>Theobroma speciosum</i> —Malvaceae). <i>Brazilian Archives of Biology and Technology</i> , 53, 861-872	[Related taxon self-incompatible] "In the present work, cacauihy's ( <i>Theobroma speciosum</i> ) floral biology was studied. Flower buds split their sepals at 14h reaching its maximum at 22h, but all flowers were fully opened at 6:00 h of the following morning. Stigmatic branches showed exudates, reaching maximum between 6:00 h and 10:00 h at the same day. Ligules and petal hoods were the floral parts with highest intensity of odour. Flowers were receptive along all the morning and noon of the anthesis day. Approximately 65% of the flowers were naturally pollinated, but only 0.85% of them set a fruit. Abscission occurred on its higher frequency at 6:00 h of the second day after anthesis. Controlled pollinations showed that cacauihy was self-incompatible species."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Glendinning, D. R. (1972). Natural pollination of cocoa. <i>New Phytologist</i> , 71(4), 719-729	"Fruit flies can effect some pollination when enclosed with flowers in large numbers (J. K. Knoke, personal communication)." [Related taxon pollinated by flies]
	Lim, T.K. (2012). <i>Edible Medicinal and Non-Medicinal Plants</i> . Volume 3, Fruits. Springer, New York	"Inflorescence axillary on the leafy juvenile branches. Sepals 5, lanceolate to ovate-lanceolate, petals 5 smaller oblong-ovate, pinkish white to reddish, stamens 5 compressed revurved filaments with bilocular anthers, ovary superior, oblong-ovate, 5-lobed, each locule with numerous ovules, styles 5 united, 1–2 mm long."

606	Reproduction by vegetative fragmentation	n
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	FAO. 1986. Food and fruit-bearing forest species 3: Examples from Latin America. FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	"Germination is rapid and good if the seed are sown immediately after removal from the pod. In good substrate nursery growth is rapid. It requires semi-shade for the first few months. No information is available about vegetative propagation."
	Martin, F.W., Campbell, C.W. & Puberté, R.M. (1987). Perennial Edible Fruits of the Tropics: An Inventory. Agriculture Handbook No. 642. U.S. Department of Agriculture, Washington, DC	"Tree to 12 m. Propagation by seed. Fruit ellipsoid, 15-20 cm long, 10-11 cm in diameter."

607	Minimum generative time (years)	>3
	<b>Source(s)</b>	<b>Notes</b>
	FAO. 1986. Food and fruit-bearing forest species 3: Examples from Latin America. FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	[5+ years] "In the field the <i>T. bicolor</i> grows rapidly, even on relatively nutrient poor soils, attaining between and 100 cm/year. Production may start in the fifth year from planting out."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	<b>Source(s)</b>	<b>Notes</b>
	FAO. 1986. Food and fruit-bearing forest species 3: Examples from Latin America. FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	[No evidence. Fruit & seeds large & lack means of external attachment] "Fruit very characteristic subglobose to oblong - or ovoid-ellipsoid, very large, 10-25 cm long, 9-15 cm in diameter, weighing g, greenish-grey when immature, ripening yellow or yellowish-brown; pericarp hard, longitudinally ribbed, the grooves prominently nerved; seeds arranged in 5 rows within the fruit and surrounded by a fibrous, juicy, cream to yellowish pulp; seeds mm long, 14-25 mm Wide, mm thick."

702	Propagules dispersed intentionally by people	y
	<b>Source(s)</b>	<b>Notes</b>
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	"It also has been introduced to other tropical areas."

Qsn #	Question	Answer
703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	FAO. 1986. Food and fruit-bearing forest species 3: Examples from Latin America. FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	[No evidence. Fruit & seeds large & unlikely to ever become a produce contaminant] "Fruit very characteristic subglobose to oblong - or ovoid-ellipsoid, very large, 10-25 cm long, 9-15 cm in diameter, weighing g, greenish-grey when immature, ripening yellow or yellowish-brown; pericarp hard, longitudinally ribbed, the grooves prominently nerved; seeds arranged in 5 rows within the fruit and surrounded by a fibrous, juicy, cream to yellowish pulp; seeds mm long, 14 25 mm Wide, mm thick." ... "In the field the <i>T. bicolor</i> grows rapidly, even on relatively nutrient poor soils, attaining between and 100 cm/year. Production may start in the fifth year from planting out."

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	"Fruit oblong or ovoid-ellipsoid to subglobose, large, 10–25 cm long by 9–15 cm across, 500–3,000 g, green to greenish brown when immature ripening yellow or yellowish- brown, pericarp hard, longitudinally ribbed, grooves prominently nerved (Plates 4 – 6). Seeds arranged in five rows enclosed by fibrous, juicy cream to pale yellow pulp, 16–30 mm by 14–25 mm. Fruit fall to ground when ripe."

705	Propagules water dispersed	
	Source(s)	Notes
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	"Fruit fall to ground when ripe" [Possible that fruits in riparian areas may be moved by water]

706	Propagules bird dispersed	
	Source(s)	Notes
	Doughty, C. E., Wolf, A., Morueta-Holme, N., Jørgensen, P. M., Sandel, B., Violle, C., Boyle, B., Kraft, N. J. B., Peet, R. K., Enquist, B. J., Svenning, J.-C., Blake, S. and Galetti, M. (2016), Megafauna extinction, tree species range reduction, and carbon storage in Amazonian forests. <i>Ecography</i> , 39: 194–203	"SI Table 4– In table 3, we show megafauna dispersed species as classified from (Guimaraes, P. R. et al. 2008). Here, we show a much more conservative potential list of megafauna dispersed species. For our more conservative list, we assume a more strict definition of megafauna dispersed fruit based on characteristics of fruit dispersed by megafauna in Africa." [Includes <i>Theobroma bicolor</i> ]
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	[Seeds might be dispersed by game birds] "Fruit oblong or ovoidellipsoid to subglobose, large, 10–25 cm long by 9–15 cm across, 500–3,000 g, green to greenish brown when immature ripening yellow or yellowish- brown, pericarp hard, longitudinally ribbed, grooves prominently nerved (Plates 4 – 6 ). Seeds arranged in fi ve rows enclosed by fibrous, juicy cream to pale yellow pulp, 16–30 mm by 14–25 mm."

707	Propagules dispersed by other animals (externally)	

Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Doughty, C. E., Wolf, A., Morueta-Holme, N., Jørgensen, P. M., Sandel, B., Violle, C., Boyle, B., Kraft, N. J. B., Peet, R. K., Enquist, B. J., Svenning, J.-C., Blake, S. and Galetti, M. (2016), Megafauna extinction, tree species range reduction, and carbon storage in Amazonian forests. <i>Ecography</i> , 39: 194–203	[Fruits & seeds lack means of external attachment, but may be carried by animals prior to consumption] "SI Table 4– In table 3, we show megafauna dispersed species as classified from (Guimaraes, P. R. et al. 2008). Here, we show a much more conservative potential list of megafauna dispersed species. For our more conservative list, we assume a more strict definition of megafauna dispersed fruit based on characteristics of fruit dispersed by megafauna in Africa." [Includes <i>Theobroma bicolor</i> ]

708	Propagules survive passage through the gut	y
	<b>Source(s)</b>	<b>Notes</b>
	Doughty, C. E., Wolf, A., Morueta-Holme, N., Jørgensen, P. M., Sandel, B., Violle, C., Boyle, B., Kraft, N. J. B., Peet, R. K., Enquist, B. J., Svenning, J.-C., Blake, S. and Galetti, M. (2016), Megafauna extinction, tree species range reduction, and carbon storage in Amazonian forests. <i>Ecography</i> , 39: 194–203	[Presumably Yes. Dispersed by megafauna] "SI Table 4– In table 3, we show megafauna dispersed species as classified from (Guimaraes, P. R. et al. 2008). Here, we show a much more conservative potential list of megafauna dispersed species. For our more conservative list, we assume a more strict definition of megafauna dispersed fruit based on characteristics of fruit dispersed by megafauna in Africa." [Includes <i>Theobroma bicolor</i> ]

801	Prolific seed production (>1000/m <sup>2</sup> )	n
	<b>Source(s)</b>	<b>Notes</b>
	NParks Flora&FaunaWeb. (2013). <i>Theobroma bicolor</i> . <a href="https://florafauanaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=7089">https://florafauanaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=7089</a> . [Accessed 3 Oct 2016]	"Fruits are elliptical and yellowish when ripe. There are 30-50 seeds per fruit, wrapped in yellow pulp."
	FAO. 1986. Food and fruit-bearing forest species 3: Examples from Latin America. FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	"No precise information is available on yields although 8-year-old plants have been observed to produce 20 fruit." [Estimated to produce ca. 600-1000 seeds/year]

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	<b>Source(s)</b>	<b>Notes</b>
	Baskin, C.C. & Baskin, J.M. 2014. <i>Seeds Ecology, Biogeography, and Evolution of Dormancy and Germination</i> . Second Edition. Academic Press, San Francisco, CA	Related taxon, <i>Theobroma cacao</i> seeds reported to be non-dormant

803	Well controlled by herbicides	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. 2016. Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Useful Tropical Plants Database. 2016. <i>Theobroma bicolor</i> . <a href="http://tropical.theferns.info/viewtropical.php?id=Theobroma+bicolor">http://tropical.theferns.info/viewtropical.php?id=Theobroma+bicolor</a> . [Accessed 3 Oct 2016]	It coppices fairly well, and can produce fruit at times when other fruits are scarce"

<b>805</b>	<b>Effective natural enemies present locally (e.g. introduced biocontrol agents)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. 2016. Personal Communication	Unknown

**Summary of Risk Traits:**

High Risk / Undesirable Traits

- Thrives in tropical climates
- Sometimes escapes cultivation
- May have allelopathic properties
- Shade tolerant
- Tolerates many soil types
- Reproduces by seeds
- Seeds dispersed by large animals & intentionally by people
- Able to coppice & resprout after cutting

Low Risk Traits

- No reports of invasiveness or naturalization (although escapes cultivation)
- Unarmed (no spines, thorns or burrs)
- Edible fruit & seeds
- Not reported to spread vegetatively
- Reaches maturity in 5+ years
- Fruit & seeds relatively large & unlikely to be inadvertently dispersed
- Seeds may be recalcitrant & unlikely to form a persistent seed bank