

Key Words: Evaluate, Naturalized, Tropical Tree, N-fixing, Fodder, Dehiscent pods

Family: *Fabaceae*

Taxon: *Flemingia macrophylla*

Synonym: *Crotalaria macrophylla* Willd. (basionym)
Flemingia congesta Roxb. ex W. T. Aiton
Moghania macrophylla (Willd.) Kuntze

Common Name: waras tree
 enoki-mame
 warrus tree

Questionnaire : current 20090513 **Assessor:** Chuck Chimera **Designation:** EVALUATE
Status: Assessor Approved **Data Entry Person:** HPWRA OrgData **WRA Score** 5

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| 101 | Is the species highly domesticated? | y=-3, n=0 | n |
| 102 | Has the species become naturalized where grown? | y=1, n=-1 | |
| 103 | Does the species have weedy races? | y=1, n=-1 | |
| 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) | |
| 401 | Produces spines, thorns or burrs | y=1, n=0 | n |
| 402 | Allelopathic | y=1, n=0 | n |
| 403 | Parasitic | y=1, n=0 | n |
| 404 | Unpalatable to grazing animals | 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 | n |
| 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 |
| 410 | Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island) | y=1, n=0 | y |

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| 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 | y |
| 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 | |
| 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 | 1 |
| 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 | |
| 705 | Propagules water dispersed | y=1, n=-1 | |
| 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 | |
| 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 | |
| 803 | Well controlled by herbicides | y=-1, n=1 | |
| 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) | y=-1, n=1 | |

Designation: EVALUATE

WRA Score 5

Supporting Data:

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| 101 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Is the species highly domesticated? No evidence] |
| 102 | 2013. WRA Specialist. Personal Communication. | NA |
| 103 | 2013. WRA Specialist. Personal Communication. | NA |
| 201 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Species suited to tropical or subtropical climate(s) - 2-High] "F. macrophylla originated in and is widely distributed in South-East Asia and in India, Sri Lanka, southern China and Taiwan." |
| 202 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Quality of climate match data 2-High] |
| 203 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Broad climate suitability (environmental versatility)? Yes] "F. macrophylla occurs in a wide range of tropical and subtropical sites up to 1800 2400 m in altitude. The best growth occurs where the mean annual rainfall exceeds 1500 mm. Different regimes of rainfall are tolerated, even if the dry season duration is 6 months. This species will tolerate a mean annual rainfall as low as 800 mm, but under these conditions growth is slow and tree form is poor. Climatological studies indicate that cultivation is unsuitable in regions where the temperature drops below 0°C (Zheng and Li, 1989)." |
| 203 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Broad climate suitability (environmental versatility)? Yes] "Altitude: 0-2 000 m, Mean annual rainfall: 1 100-2 850 mm" [Elevation range exceeds 1000 m] |
| 204 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Native or naturalized in regions with tropical or subtropical climates? Yes] "F. macrophylla originated in and is widely distributed in South-East Asia and in India, Sri Lanka, southern China and Taiwan." |
| 204 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Native or naturalized in regions with tropical or subtropical climates? Yes] "Native: Brunei, Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Taiwan, Province of China, Thailand, Vietnam" |
| 205 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Does the species have a history of repeated introductions outside its natural range? Yes] "Due to its long use throughout East, Central and West Africa, Hawaii and North Australia for soil improvement and fuelwood, this species has become naturalized in these countries (Zheng and Li, 1989). It has also been introduced to Papua New Guinea, and is cultivated in Tropical America." |
| 205 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Does the species have a history of repeated introductions outside its natural range? Yes] "Exotic: Argentina, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Cameroon, Central African Republic, Chad, Chile, Colombia, Congo, Costa Rica, Cote d'Ivoire, Democratic Republic of Congo, Ecuador, French Guiana, Gabon, Gambia, Ghana, Guatemala, Guinea, Guyana, Honduras, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mauritania, Mexico, Namibia, Nicaragua, Niger, Nigeria, Panama, Papua New Guinea, Paraguay, Peru, Senegal, Sierra Leone, South Africa, Surinam, Swaziland, Tanzania, Togo, Uganda, Uruguay, Venezuela" |
| 301 | 1984. Asare, F-O./Shebu, Y./Agishi, E.A.. Preliminary studies on indigenous species for dry season grazing in the Northern Guinea Savanna Zone of Nigeria. Tropical Grasslands. 18: 148-152. | [Naturalized beyond native range? Yes. Flemingia is native to Asia, but is considered naturalized in Sub-Saharan Africa] |
| 301 | 1997. Hanum, I.F./Van der Maesen, L.J.G. (eds.). PROSEA : Plant Resources of South-East Asia 11, Auxiliary Plants. Prosea Foundation, Bogor, Indonesia | [Naturalized beyond native range? Yes] "It has been introduced and naturalized in Papua New Guinea, East, Central and West Africa and is cultivated in tropical America." |
| 301 | 2001. Space, J.C./Flynn, T.. Report to the Kingdom of Tonga on invasive plant species of environmental concern. USDA Forest Service, Honolulu, HI | [Naturalized beyond native range? Yes] "A closely related species, F. macrophylla, was noted in cultivation on Vava'u and at the MAF agricultural station on Tongatapu. Both species have naturalized in Jamaica and F. macrophylla is showing signs of naturalizing where it has been planted in American Samoa. These species should not be planted more widely or introduced to islands where they are not present." |

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| 301 | 2011. Parker, J.L./Parsons, B.. New Plant Records from the Big Island for 2010–2011. Bishop Museum Occasional Papers. 113: 65–74. | [Naturalized beyond native range? Yes] "Found naturalizing near agricultural land, it most likely spread from a planting for some agricultural use, such as a cover crop for nitrogen-enrichment. It has also been seen naturalizing in a vacant lot in Hakalau, and cultivated at a botanical garden in 'Uma'uma, but it is unknown how frequently this plant is cultivated." |
| 302 | 2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia | [Garden/amenity/disturbance weed? No evidence] |
| 303 | 2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia | [Agricultural/forestry/horticultural weed? No evidence] |
| 304 | 2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia | [Environmental weed? No evidence] |
| 305 | 2012. Lopez, O.R.. Introduced Alien Plant Species in the Neotropics: the Panama Case. The Open Ecology Journal. 5: 84-89. | [Congeneric weed?] "Table 3. List of Problematic Alien Plant Species given by Family, Scientific Name, Growth Habit, Uses and Region of Origin Known to Occur in Panama that have been Reported as Invasive or Problematic Elsewhere. Nomenclature Follows Missouri Botanical Gardens" [Includes <i>Flemingia strobilifera</i>] |
| 305 | 2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia | [Congeneric weed? Possibly] <i>Flemingia strobilifera</i> naturalized and showing signs of becoming invasive, but negative impacts have not been explicitly documented |
| 401 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Produces spines, thorns or burrs? No] " <i>F. macrophylla</i> is a woody, tussock-forming shrub, and may reach up to 4 m in height. This species has a spreading crown, with sulfate silky young branches, and is deep-rooting." |
| 402 | 1993. Hauser, S.. Effect of <i>Acioa barteri</i> , <i>Cassia siamea</i> , <i>Flemingia macrophylla</i> and <i>Gmelina arborea</i> leaves on germination and early development of maize and cassava. Agriculture, Ecosystems & Environment. 45(3–4): 263-273. | [Allelopathic? No] "It can therefore be assumed that <i>F. macrophylla</i> and <i>A. bateri</i> have no allelopathic effect on maize." |
| 402 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Allelopathic? No evidence] "Shade or shelter: A cover and shade crop in young plantations of cocoa, sisal, coffee, banana, plantain, oil palm and rubber; also acts as a good windbreak. In Madagascar, it is planted as a windbreak in tea plantations at Lac Alaotra." |
| 403 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Parasitic? No evidence] Fabaceae |
| 404 | 1999. Muhr, L./Tarawali, S.A./Peters, M./Schultze-Kraft, R.. Forage legumes for improved fallows in agropastoral systems of subhumid West Africa. I. Establishment, herbage yield and nutritive value of legumes as dry season forage. Tropical Grasslands. 33(| [Unpalatable to grazing animals? No, but less palatable than other fodder trees] "Species with known low palatability, such as <i>F. macrophylla</i> (Thomas and Schultze-Kraft 1990), may be consumed only at later stages in the dry season. If they are not consumed at all, they may play an important role by preventing the over grazing of the improved fallow area and may contribute to the expected soil-fertility enhancement for a subsequent cropping phase." |
| 404 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Unpalatable to grazing animals? No] " <i>F. macrophylla</i> is used as fodder since its leaves and seeds have a high protein content (Chen et al., 1993). " |
| 404 | 2007. Chakeredza, S./Hove, L./Akinnifesi, F.K./Franzel, S./Ajayi, O.C./Sileshi, G.. Managing fodder trees as a solution to human–livestock food conflicts and their contribution to income generation for smallholder farmers in southern Africa. Natural Resou | [Unpalatable to grazing animals? No] "Research work carried out in Zimbabwe by Dzwowela et al. (1994) with small east African goats established substantial increases in total feed intake and improved weight gains using <i>A. angustissima</i> , <i>L. leucocephala</i> , <i>C. calothyrsus</i> and <i>Flemingia macrophylla</i> as supplements to natural pasture hay." ... "Table 1. Nutritional characteristics (% of dry matter) of important fodder trees" [<i>Flemingia macrophylla</i> - Comments = Leaf and browseable twigs] |
| 404 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Unpalatable to grazing animals? No] "Fodder: In some areas, such as Ghana, <i>F. macrophylla</i> remains green throughout the year and retains most of its leaf during the dry season, making it suitable as a dry-season browse species. Palatability of immature herbage is considerably better than that of old mature herbage." |
| 405 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Toxic to animals? No evidence] " <i>F. macrophylla</i> is used as fodder since its leaves and seeds have a high protein content (Chen et al., 1993). " |
| 405 | 2005. Cook, B.G./Pengelly, B.C./Brown, S.D.et al.. Tropical Forages: an interactive selection tool., [CD-ROM],. SIRO, DPI&F(Qld), CIAT and ILRI, http://www.tropicalforages.info/index.htm | [Toxic to animals? No] "Toxicity - No apparent toxicities, but can lead to suppressed intake." |

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| 405 | 2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL | [Toxic to animals? No evidence] |
| 406 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Host for recognized pests and pathogens?] "In southern China a major problem in <i>F. macrophylla</i> plantations is leaf white mildew (<i>Oidium</i> sp.), which is often caused by sustained drought. Spraying with sulfur powder at a dosage of 350 kg/ha is effective. During the monsoon, high humidity on waterlogging sites may cause by rust fungus (<i>Puccinia</i> sp.) damage on planting stock (Gu, 1993). <i>Hypomeces squamosus</i> , the sugarcane shoot borer or green scaly weevil, is a major pest in southern China, and may be controlled by common insecticides (Xiao, 1992)." |
| 406 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Host for recognized pests and pathogens? No] "Insect pests such as the fly <i>Agromyza</i> spp. reduce seed production by laying eggs in green pods. <i>F. macrophylla</i> is an off-season host for the pod fly <i>Melanagromyza obtusa</i> , an important pest of pigeonpea, especially in central and northern India." [Flemingia is an off-season host for the podfly, <i>Melanagromyza obtusa</i> , an important pest of pigeonpea, but this is not a significant crop in the Pacific] |
| 407 | 2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL | [Causes allergies or is otherwise toxic to humans? No evidence] |
| 407 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Causes allergies or is otherwise toxic to humans? No evidence] "Tannin or dyestuff: One of the sources of the Arab dye called 'waras' or 'warrus'. It is a coarse purple or orange-brown powder consisting of the glandular hairs rubbed from dry <i>Flemingia</i> fruit; capable of dyeing silk but not wool or cotton, the active component is called flemingin. Medicine: In Indonesia and Malaysia, the leaves are used medicinally. In China, a decoction is used to bathe sores and swellings, while in Taiwan it is an antipyretic for treating postpartum fever and is used to treat paralysis and pain in the joints." |
| 408 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Creates a fire hazard in natural ecosystems? No evidence] |
| 408 | 2005. Cook, B.G./Pengelly, B.C./Brown, S.D.et al.. Tropical Forages: an interactive selection tool., [CD-ROM],. SIRO, DPI&F(Qld), CIAT and ILRI, http://www.tropicalforages.info/index.htm | [Creates a fire hazard in natural ecosystems? No evidence] "Moderate fire tolerance" |
| 409 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Is a shade tolerant plant at some stage of its life cycle? Yes. Can establish in shady sites] " <i>F. macrophylla</i> is a light-demanding species that readily colonizes on exposed fertile soil. Full overhead light is necessary for vigorous growth, however, this species will survive in light shade. " |
| 409 | 2005. Cook, B.G./Pengelly, B.C./Brown, S.D.et al.. Tropical Forages: an interactive selection tool., [CD-ROM],. SIRO, DPI&F(Qld), CIAT and ILRI, http://www.tropicalforages.info/index.htm | [Is a shade tolerant plant at some stage of its life cycle? Yes] "Moderate to high shade tolerance, grouped with <i>Calopogonium caeruleum</i> and <i>Desmodium heterocarpon</i> subsp. <i>ovalifolium</i> ." |
| 410 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Tolerates a wide range of soil conditions? Yes] "This species may tolerate a diverse range of soils, yet grows well on freely draining and fertile sites. <i>F. macrophylla</i> is often found on slopes and exposed areas. It may tolerate poor and acidic soils with a high aluminium content (Faridah Hanum and van der Maesen, 1997)." |
| 410 | 2005. Cook, B.G./Pengelly, B.C./Brown, S.D.et al.. Tropical Forages: an interactive selection tool., [CD-ROM],. SIRO, DPI&F(Qld), CIAT and ILRI, http://www.tropicalforages.info/index.htm | [Tolerates a wide range of soil conditions? Yes] "Will grow on most soils, with very low to moderate (and even high) fertility, with a pH range from 4-8, and high soluble aluminium (80% saturation)." |
| 410 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Tolerates a wide range of soil conditions? Yes] "Soil type: Found naturally on both on clay and lateritic soils. The species has an outstanding adaptation to acid (pH 4.6) and infertile soils with high soluble aluminium (80% saturation)." |
| 411 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Climbing or smothering growth habit? No] " <i>F. macrophylla</i> is a woody, tussock-forming shrub, and may reach up to 4 m in height. This species has a spreading crown, with sulfate silky young branches, and is deep-rooting." |
| 412 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Forms dense thickets? No evidence] |
| 412 | 2005. Cook, B.G./Pengelly, B.C./Brown, S.D.et al.. Tropical Forages: an interactive selection tool., [CD-ROM],. SIRO, DPI&F(Qld), CIAT and ILRI, http://www.tropicalforages.info/index.htm | [Forms dense thickets? No evidence] |

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| 412 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Forms dense thickets? No evidence] |
| 412 | 2013. WRA Specialist. Personal Communication. | [Forms dense thickets? No evidence] Documented to be naturalized, but with no indication of forming thickets or monocultures |
| 501 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Aquatic? No] "The species is found naturally growing along watercourses in secondary forest, as well as under drier conditions such as in fields infested with <i>Imperata cylindrica</i> ." |
| 502 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Grass? No] Fabaceae |
| 503 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Nitrogen fixing woody plant? Yes] "F. macrophylla is a woody, tussock-forming shrub, and may reach up to 4 m in height. " ... "Its nitrogen fixing ability results in soil improvement, and the extensive root system aid soil conservation." |
| 503 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Nitrogen fixing woody plant? Yes] "Nitrogen fixing: F. macrophylla forms root nodules and fixes atmospheric nitrogen in symbiosis with Bradyrhizobium strains. Root nodules are often difficult to locate, partly because they are very small." |
| 504 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "F. macrophylla is a woody, tussock-forming shrub, and may reach up to 4 m in height. This species has a spreading crown, with sulfate silky young branches, and is deep-rooting." |
| 601 | 2013. WRA Specialist. Personal Communication. | [Evidence of substantial reproductive failure in native habitat? No evidence] |
| 602 | 1997. Hanum, I.F./Van der Maesen, L.J.G. (eds.). PROSEA : Plant Resources of South-East Asia 11, Auxiliary Plants. Prosea Foundation, Bogor, Indonesia | [Produces viable seed? Yes] "F. macrophylla is propagated by seed." |
| 603 | 2013. WRA Specialist. Personal Communication. | [Hybridizes naturally? Unknown] |
| 604 | 1995. Roshetko, J.M.. Community-based Tree Seed Production with <i>Desmodium rensonii</i> and <i>Flemingia macrophylla</i> . A publication of the Agroforestry Information Service. Number 13. Winrock International, Morrilton, Arkansas www.winrock.org/forestry/factnet.htm | [Self-compatible or apomictic? Presumably Yes] "Seed should not have been collected from isolated trees because they may have been self-pollinated or pollinated by only a few individuals." |
| 604 | 2007. Heider, B./Andersson, M.S./Schultze-Kraft, R.. RAPD variation among North Vietnamese <i>Flemingia macrophylla</i> (Willd.) Kuntze ex Merr. Accessions. Plant Conservation and Biodiversity. 6: 43-57. | [Self-compatible or apomictic? Yes] "F. macrophylla is mainly selfing..." |
| 605 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Requires specialist pollinators? No] "The flowers have very short pedicels, in oblong racemes 2.5-5 cm in length; red or purple; bracts lanceolate, to 5 cm in length, tomentose, caducous; calyx to 1 cm in length, with linear-lanceolate teeth, tomentose; corolla scarcely exerted, the keel obtuse." [Floral morphology suggests no] |
| 606 | 2005. Cook, B.G./Pengelly, B.C./Brown, S.D. et al.. Tropical Forages: an interactive selection tool., [CD-ROM],. SIRO, DPI&F(Qld), CIAT and ILRI, http://www.tropicalforages.info/index.htm | [Reproduction by vegetative fragmentation? No evidence] "Ability to spread - Spread by seed only." |
| 607 | 2005. Cook, B.G./Pengelly, B.C./Brown, S.D. et al.. Tropical Forages: an interactive selection tool., [CD-ROM],. SIRO, DPI&F(Qld), CIAT and ILRI, http://www.tropicalforages.info/index.htm | [Minimum generative time (years)? 1] "Produces flowers and seed within 6-7 months from planting, although first year seed yields are low." |
| 701 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? No] "The pods are cylindrical, inflated, 8-10 mm in length and 5 mm in width, covered with fine glandular hair, dehiscent, dark brown, 2 seeded. Seeds globular, 2 mm in diameter, shiny, black." [The propagules do not have any means of attaching and hence it is less likely to be dispersed unintentionally] |

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| 702 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Propagules dispersed intentionally by people? Yes] "Plantations have been established on a large scale in south China and India in order to breed lac insects. In Nepal and Bhutan, this species is also used in agroforestry. Due to its long use throughout East, Central and West Africa, Hawaii and North Australia for soil improvement and fuelwood, this species has become naturalized in these countries (Zheng and Li, 1989). It has also been introduced to Papua New Guinea, and is cultivated in Tropical America." |
| 703 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Propagules likely to disperse as a produce contaminant? No] "The pods are cylindrical, inflated, 8-10 mm in length and 5 mm in width, covered with fine glandular hair, dehiscent, dark brown, 2 seeded. Seeds globular, 2 mm in diameter, shiny, black." [The species is not a major horticultural or forestry species and hence the seeds are less likely to be introduced as a produce contaminant.] |
| 704 | 1995. Roshetko, J.M.. Community-based Tree Seed Production with <i>Desmodium rensonii</i> and <i>Flemingia macrophylla</i> . A publication of the Agroforestry Information Service. Number 13. Winrock International, Morrilton, Arkansas www.winrock.org/forestry/factnet.htm | [Propagules adapted to wind dispersal? Possibly Short distances] "At maturity, the pods turn brown and split, discharging their seeds." |
| 704 | 2003. Puyravaud, J.-P./Dufour, C./Aravajy, S.. Rain forest expansion mediated by successional processes in vegetation thickets in the Western Ghats of India. <i>Journal of Biogeography</i> . 30: 1067-1080. | [Propagules adapted to wind dispersal?] "We distinguished four categories of dispersal agents: birds, mammals, wind and mechanical means." [Table 1. <i>Flemingia macrophylla</i> - Dispersal agent = mechanical. The authors of this paper do not consider the dehiscent pods of <i>Flemingia</i> to be an adaptation to wind dispersal] |
| 705 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Propagules water dispersed? Possibly] "The species is found naturally growing along watercourses in secondary forest, as well as under drier conditions such as in fields infested with <i>Imperata cylindrica</i> ." |
| 706 | 2003. Puyravaud, J.-P./Dufour, C./Aravajy, S.. Rain forest expansion mediated by successional processes in vegetation thickets in the Western Ghats of India. <i>Journal of Biogeography</i> . 30: 1067-1080. | [Propagules bird dispersed? No] "We distinguished four categories of dispersal agents: birds, mammals, wind and mechanical means." [Table 1. <i>Flemingia macrophylla</i> - Dispersal agent = mechanical] |
| 706 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Propagules bird dispersed? No] "The pods are cylindrical, inflated, 8-10 mm in length and 5 mm in width, covered with fine glandular hair, dehiscent, dark brown, 2-seeded. Seeds globular, 2 mm in diameter, shiny, black." |
| 707 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Propagules dispersed by other animals (externally)? No] "The pods are cylindrical, inflated, 8-10 mm in length and 5 mm in width, covered with fine glandular hair, dehiscent, dark brown, 2-seeded. Seeds globular, 2 mm in diameter, shiny, black." [The propagules do not have any means of attaching and hence less likely to be dispersed externally by animals.] |
| 708 | 2013. WRA Specialist. Personal Communication. | [Propagules survive passage through the gut? Unknown] No direct evidence. The fruit is not bird dispersed and no evidence of animal dispersal. |
| 801 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Prolific seed production (>1000/m ²)? No] "The pods are cylindrical, inflated, 8-10 mm in length and 5 mm in width, covered with fine glandular hair, dehiscent, dark brown, 2 seeded. Seeds globular, 2 mm in diameter, shiny, black." |
| 801 | 2006. Hui, L./Keqin, W.. Soil seed bank and aboveground vegetation within hillslope vegetation restoration sites in Jinshajing hot-dry river valley. <i>Acta Ecologica Sinica</i> . 26(8): 2432-2442. | [Prolific seed production (>1000/m ²)? No] "Table 1 Characteristics of soil seed bank (Mean ± SD, seeds / m ²)" [<i>Flemingia macrophylla</i> : Grazing land = 37.8±11.8 seeds / m ² ; Gully = 58.4±20.2 seeds / m ² ; Slope = 39.3±18.9 seeds / m ² ; Terrace = 102.2±57.9 seeds / m ²] |
| 802 | 2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK | [Evidence that a persistent propagule bank is formed (>1 yr)? Yes] " <i>F. macrophylla</i> is propagated from seed. It is classified as orthodox, yet after 6 months storage seed germination rates will sharply decrease, due to the high fat content becoming rancid." |
| 803 | 1995. Roshetko, J.M.. Community-based Tree Seed Production with <i>Desmodium rensonii</i> and <i>Flemingia macrophylla</i> . A publication of the Agroforestry Information Service. Number 13. Winrock International, Morrilton, Arkansas www.winrock.org/forestry/factnet.htm | [Well controlled by herbicides? Unknown] "Herbicide effects - No information available." |
| 804 | 2005. Cook, B.G./Pengelly, B.C./Brown, S.D. et al.. Tropical Forages: an interactive selection tool., [CD-ROM],. SIRO, DPI&F(Qld), CIAT and ILRI, http://www.tropicalforages.info/index.htm | [Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "Excellent coppicing and regrowth capacity after cutting, producing numerous shoots from buds near the base of the stem . Cut at intervals of 6-14 weeks at 35-100 cm above the ground. Cutting interval depends on climatic conditions." |

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| 804 | 2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/) | [Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "Under tropical, humid, lowland conditions in Cote d'Ivoire, with 10 000 plants/ha and 9 regrowth cycles of 3 months each, an average annual production of 12 t/ha of leaf dry matter has been achieved, although typical yields in Southeast Asia may be closer to 8 t/ha. Plants can be cut more frequently than every 3 months, but preferably not at intervals of less than 40 days. With an excellent coppicing capacity, the shrub will survive under this cutting regime for many years." |
| 805 | 2013. WRA Specialist. Personal Communication. | [Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown] Did not find any evidence on biocontrol being introduced to control for this species. |

Summary of Risk Traits

High Risk / Undesirable Traits

- Naturalized in Hilo, Hawaii, Sub-Saharan Africa, Papua New Guinea and possibly elsewhere (including American Samoa)
- Thrives in tropical climates
- Can grow from elevations of 0-2000 m within native range
- Other *Flemingia* species have also become naturalized
- Shade tolerant
- Tolerates many soil conditions (and potentially able to exploit many different habitat types)
- N-fixing tree (could alter soil chemistry)
- Self-compatible
- Produces flowers and seed within 6-7 months from planting
- Seeds dispersed from dehiscent pods (& possibly short distances by wind)
- Able to coppice & continuously resprout after cutting

Low Risk / Desirable Traits

- Despite ability to spread, no negative impacts have been documented
- Unarmed (no spines, thorns or burrs)
- Fodder tree
- Non-toxic
- Medicinal uses
- Used for soil improvement and as a source of fuelwood
- Timber tree
- Seeds may not persist in the soil or form a long-lived seed bank

Note: Revised assessment completed 28 Jan 2013. Original posted on 07 Oct 2002. Original score = 4. Original rating = L (HPWRA)