

Taxon: Eragrostis tef (Zuccagni) Trotter	Family: Poaceae
Common Name(s): Abyssinian love grass tef teff grass	Synonym(s): Eragrostis abyssinica (Jacq.) Link Poa abyssinica Jacq. Poa tef Zuccagni

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 29 Aug 2016
WRA Score: 5.0	Designation: EVALUATE	Rating: Evaluate

Keywords: Domesticated Grass, Naturalized, Fodder, Crop, Self-Pollinating

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	y
102	Has the species become naturalized where grown?	y=1, n=-1	y
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)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
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		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems		
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	y
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	n
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)		
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m2)	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)		
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?	y
	Source(s)	Notes
	National Research Council. 1996. Lost Crops of Africa: Volume I: Grains. National Academy Press, Washington, D.C.	"Tef was grown in Ethiopia before recorded history and its domestication and early use is lost in antiquity. Its most likely ancestor is <i>Eragrostis pilosa</i> , a wild species that looks very similar and has the same chromosome number. Samples claimed to be tef have been found in the tombs of the Egyptian pharaohs. The plant is still harvested in the wild—and wild tef is eaten, sometimes on a considerable scale, in mixtures with other wild grains"

102	Has the species become naturalized where grown?	y
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 25 Aug 2016]	"Naturalized: . sometimes natzd. elsewhere"
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Tef can be found as an escape from cultivation along roadsides and railway lines, and in dry grassland on sandy loam soils. "

103	Does the species have weedy races?	
	Source(s)	Notes
	Australian Biological Resources Study. 2002. Flora of Australia, Volume 43. Poaceae 1. Introduction and Atlas. CSIRO Publishing, Collingwood, Australia	" <i>Eragrostis tef</i> provides food, grain and hay in Africa. but is becoming a spreading weed in Australia."
	Mengistu, D. K., & Mekonnen, L. S. (2011). Integrated agronomic crop managements to improve Tef productivity under terminal drought. Pp. 235-254 in I. M. M. Rahman & H. Hasegawa (eds.). Water Stress. InTech, Rijeka, Croatia	"Studies so far carried out on morphological, cytological and biochemical characters of wild and cultivated species of tef revealed that Ethiopia is the origin and center of diversity of tef even though the wild relative, <i>Eragrostis pilosa</i> , a weedy species, occurs throughout the world in tropical and temperate regions (e.g. Vavilov, 1951). This wild relative is the closest relative of the cultivated tef, <i>E. tef</i> ."
	FAO. 2016. Grassland Species Profiles - <i>Eragrostis tef</i> . http://www.fao.org/ag/agp/AGPC/doc/Gbase/data/Pf000247.HTM . [Accessed 29 Aug 2016]	[Listed as a weed] "An annual forming scanty tufts; culms up to 120 cm high in selected cultivated plants, but often only 20 cm when growing as a weed..."
	Harlan, J. R. (1971). Agricultural origins: centers and noncenters. <i>Science</i> , 174(4008), 468-474	[Possibly. Wild & weed forms discussed] "Tef (<i>Eragrostis tef</i>) is grown on a very large scale in Ethiopia, but almost nowhere else. The range of wild and weed forms is not known, although tef appears to have become naturalized in parts of South Africa. Chat and arabica coffee are also important Ethiopian domesticates."

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
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Qsn #	Question	Answer
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Tef originated in northern Ethiopia, where it is widely cultivated. Details of its domestication are unknown, but it may predate the introduction of wheat and barley to the region. Tef is perhaps descended from the closely related wild <i>Eragrostis pilosa</i> (L.) P.Beauv., which is a tetraploid (2n = 40) annual like tef, and which has a cosmopolitan distribution. Grain cultivation of tef has been confined mainly to Ethiopia and to some extent the highlands of Eritrea. It is also grown in northern Kenya."

202	Quality of climate match data	High
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	National Research Council. 1996. <i>Lost Crops of Africa: Volume I: Grains</i> . National Academy Press, Washington, D.C.	"Tef holds promise for many countries beyond Africa. Mexico, Bolivia, Peru, Ecuador, India, Pakistan, Nepal, and Australia might well adopt it. In addition, this plant's rapid maturity and inherent cold tolerance may open new areas of grain cultivation for high latitudes where growing seasons are short—Canada, Alaska, the Soviet Union,"
	Ketema, S. 1997. Tef. <i>Eragrostis tef</i> (Zucc.) Trotter. Promoting the conservation and use of underutilized and neglected crops. 12. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"Tef is adapted to a wide range of environments and is presently cultivated under diverse agroclimatic conditions. It can be grown from sea level up to 2800 m asl, under various rainfall, temperature and soil regimes. However, according to experiences gained so far from national yield trials, conducted at different locations across the country, tef performs excellently at an altitude of 1800-2100 m, annual rainfall of 750-850 mm, growing season rainfall of 450-550 mm and a temperature range of 10°C-27°C. A very good result can also be obtained at an altitude range of 1700-2200 m and growing-season rainfall of 300 mm."
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	[Elevation range of 2800 m, demonstrating environmental versatility] "Tef is a very versatile cereal and grows in a wide range of environments, from sea-level up to 2800 m altitude. The highest yields are obtained at altitudes of 1800–2100 m, an annual rainfall of 750–850 mm, a seasonal (July–December) rainfall of 450–550 mm and an average daily temperature range of 15–27°C."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	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	"NE Africa, Ethiopia."

Qsn #	Question	Answer
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Tef originated in northern Ethiopia, where it is widely cultivated." ... "It is also grown in northern Kenya."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	FAO. 2016. Grassland Species Profiles - <i>Eragrostis tef</i> . http://www.fao.org/ag/agp/AGPC/doc/Gbase/data/Pf000247.HTM . [Accessed 29 Aug 2016]	"Native of Ethiopia, introduced into other tropical countries."
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Small-scale commercial tef production takes place in South Africa, the United States, Canada, Australia, Europe (the Netherlands) and Yemen. Tef is grown as a forage grass, for instance in South Africa, Morocco, Australia, India and Pakistan. It has been introduced experimentally into other tropical countries, either for its grain or for hay, e.g. in other parts of East Africa and in southern Africa."

301	Naturalized beyond native range	y
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 25 Aug 2016]	"Naturalized: . sometimes natzd. elsewhere"
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Tef can be found as an escape from cultivation along roadsides and railway lines, and in dry grassland on sandy loam soils."
	Klaassen, E. S., & Kwembeya, E. G. (2013). A Checklist of Namibian Indigenous and Naturalised Plants. Occasional Contributions, 5. National Botanical Research Institute, Windhoek, Namibia	<i>Eragrostis tef</i> (Zuccagni) Trotter - Naturalised

302	Garden/amenity/disturbance weed	
	Source(s)	Notes
	Australian Biological Resources Study. 2002. Flora of Australia, Volume 43. Poaceae 1. Introduction and Atlas. CSIRO Publishing, Collingwood, Australia	[Designated a weed of unspecified impacts] " <i>Eragrostis tef</i> provides food, grain and hay in Africa. but is becoming a spreading weed in Australia."

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
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Qsn #	Question	Answer
	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	y
	Source(s)	Notes
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Eragrostis curvula ... Where invasive, it becomes dominant on low-fertility soils and the dense tussocks displace native vegetation." ... "Eragrostis lehmanniana" ... "It is invasive because it spreads quickly and covers native desert vegetation, displacing native grasses and forbs. Dense stands have a reduces faunal diversity. The grass invades grassland seemingly undisturbed by livestock or humans. Seed production is high, and seeds are dispersed by water and wind. A large seed bank is accumulated in the soil. The grass increases fire frequency due to accumulation of a large amount of litter and dead stems."

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Annual, tufted grass, up to 150(–200) cm tall, with a shallow, fibrous root system; stem (culm) usually erect, simple or sparsely branched. Leaves 2–6 per culm, alternate, simple; leaf sheath glabrous; ligule 0.5–1 mm long, ciliate; blade linear, 25–45 cm × 0.1–0.5 cm, glabrous."

402	Allelopathic	n
	Source(s)	Notes
	Ketema, S. 1997. Tef. <i>Eragrostis tef</i> (Zucc.) Trotter. Promoting the conservation and use of underutilized and neglected crops. 12. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[No evidence of allelopathy] "It is mainly cultivated as a monocrop, but occasionally under a multiple cropping system. In such cases it is usually grown as an intercrop with rapeseed (<i>Brassica napus</i>), safflower (<i>Carthamus tinctorius</i>) and sunflower (<i>Helianthus annuus</i>) or relay-cropped with maize (<i>Zea mays</i>) and sorghum (<i>Sorghum bicolor</i>). It is also cropped sequentially in a crop-rotation system in the mid- and high-altitude areas after chickpea (<i>Cicer arietinum</i>), field pea (<i>Pisum sativum</i>), faba bean (<i>Vicia faba</i>) and grass pea (<i>Lathyrus sativus</i>); while at low-and some mid-altitude areas it is 'grown after haricot bean (<i>Phaseolus vulgaris</i>). Usually a 4-5 year rotation cycle is practised. In a 4-year rotation cycle the sequence followed would be: pulse/tef/tef (or another cereal, for example, wheat or barley)/pulse. In a 5-year rotation cycle the sequence would be: pulse/tef/tef/other cereal/pulse."

Qsn #	Question	Answer
403	Parasitic	n
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Annual, tufted grass, up to 150(–200) cm tall, with a shallow, fibrous root system; stem (culm) usually erect, simple or sparsely branched." [No evidence. Poaceae]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"high grazing value, extremely palatable and very well grazed, valuable hay and pasture grass suitable for all kinds of stock"
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"In Ethiopia tef straw is used as forage, especially during the dry season." ... "Outside Ethiopia tef is mainly grown for hay (e.g. in South Africa) and as green fodder (e.g. in Morocco and India)."

405	Toxic to animals	n
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence] "high grazing value, extremely palatable and very well grazed, valuable hay and pasture grass suitable for all kinds of stock"

Qsn #	Question	Answer
406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"A number of diseases (mainly caused by fungi) and pests are known to attack tef, but only a few are of economic importance, mostly in specific localities and production years. Among the diseases, leaf rust (<i>Uromyces eragrostidis</i>), head smudge (<i>Helminthosporium miyakei</i>) and damping off (<i>Drechslera</i> spp. and <i>Epicoccum nigrum</i>) are the most important. Low plant densities and early sowing reduce the damage caused by leaf rust and damping off, respectively. Fungicides that control these two diseases have been identified at experimental level, although there are no known cases of field applications. Breeding for resistance has not been carried out because of limited genetic variation in resistance and the sporadic nature and environmental specificity of the diseases. No viral or bacterial diseases are known. Pests known to attack germinating tef seeds and seedlings include the Wollo bush-cricket (<i>Decticooides brevipennis</i>), the red tef worm (<i>Mentaxya ignicollis</i>), grasshoppers, ants and termites. The black tef beetle (<i>Erlangerius niger</i>) attacks the inflorescence. Among the weeds, annual grasses cause the biggest damage. The parasitic weed <i>Striga hermonthica</i> (Delile) Benth., the recently introduced invasive weed <i>Parthenium hysterophorus</i> L. and the cosmopolitan weed <i>Convolvulus arvensis</i> L. have also become problematic. Hand weeding and crop rotation, particularly with pulses, are the most common methods in dealing with these weeds in tef; the use of herbicides is very limited. Stored tef grains are not attacked by storage insects, but rodents can be a problem."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence] "one of the faster growing hay crops known, food and fodder, straw used in brick manufacture, cultivated cereal, high grazing value, extremely palatable and very well grazed, valuable hay and pasture grass suitable for all kinds of stock, widely grown for hay, seed eaten by wildlife and cattle, cultivated by the ancient Egyptians, good for erosion control, in Ethiopia grains ground to flour and used for making unleavened bread and a pancake (injera), similar to <i>Eragrostis pilosa</i> "
	National Research Council. 1996. Lost Crops of Africa: Volume I: Grains. National Academy Press, Washington, D.C.	[No evidence] "This staple cereal (<i>Eragrostis tef</i>) is the most esteemed grain in Ethiopia. It is ground into flour and made into pancake-like fermented bread, injera, that forms the basic diet of millions. Many Ethiopians eat it several times a day (when there is enough), particularly with spicy sauces, vegetables, and stews. Tef is nutritious; the grain is about 13 percent protein, well balanced in amino acids, and rich in iron."

408	Creates a fire hazard in natural ecosystems	
	Source(s)	Notes

Qsn #	Question	Answer
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	[Could possibly add to fuel load in drought conditions] "Despite its shallow root system, tef is drought resistant, due to its ability to regenerate quickly after moderate water stress and to produce grain in a relatively short period. Its rapid vegetative growth and short life cycle make tef particularly suitable for areas subject to drought after short rains."

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	Plants for a Future. 2016. <i>Eragrostis tef</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Eragrostis+tef . [Accessed 29 Aug 2016]	"It cannot grow in the shade."
	Practical Plants. 2016. <i>Eragrostis tef</i> . http://practicalplants.org/wiki/Eragrostis_tef . [Accessed 29 Aug 2016]	"Sun: full sun Shade: no shade"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Ketema, S. 1997. Tef. <i>Eragrostis tef</i> (Zucc.) Trotter. Promoting the conservation and use of underutilized and neglected crops. 12. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"Tef is adapted to a wide range of environments and is presently cultivated under diverse agroclimatic conditions. It can be grown from sea level up to 2800 m asl, under various rainfall, temperature and soil regimes."
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Tef is mostly grown on Vertisols (dark, heavy clay soils with well-developed horizons) and Andosols (young, shallow soils, weathered from volcanic ash under humid conditions). Vertisol grown tef gives higher yields provided that prolonged waterlogging does not prevail and sufficient nutrients, particularly N, are available. Farmers usually alleviate the effects of waterlogging by adjusting their planting date or using surface drainage systems (furrows). Micronutrient deficiencies can also be limiting factors on Vertisols. Tef is normally grown on soils of neutral pH, but it has been observed that it tolerates soil acidities below pH 5."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Annual, tufted grass, up to 150(–200) cm tall, with a shallow, fibrous root system; stem (culm) usually erect, simple or sparsely branched."

Qsn #	Question	Answer
412	Forms dense thickets	n
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Tef is a very versatile cereal and grows in a wide range of environments, from sea-level up to 2800 m altitude." [No evidence of naturally occurring dense stands]

501	Aquatic	n
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	[Terrestrial] "Annual, tufted grass, up to 150(–200) cm tall"

502	Grass	y
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 25 Aug 2016]	Family: Poaceae (alt.Gramineae) Subfamily: Chloridoideae Tribe: Eragrostideae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Annual, tufted grass, up to 150(–200) cm tall, with a shallow, fibrous root system; stem (culm) usually erect, simple or sparsely branched."

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Annual, tufted grass, up to 150(–200) cm tall, with a shallow, fibrous root system; stem (culm) usually erect, simple or sparsely branched."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Tef originated in northern Ethiopia, where it is widely cultivated. Details of its domestication are unknown, but it may predate the introduction of wheat and barley to the region."

Qsn #	Question	Answer
602	Produces viable seed	y
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Seeds mature within a month after pollination. The total growth cycle from sowing to maturity is -5(-6) months. Tef follows the C4-cycle photosynthetic pathway." ... "Tef is propagated by seed. There is no seed dormancy and germination is rapid."

603	Hybridizes naturally	n
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Crossability relationships among the species are largely unknown. Hybridization of tef is a tedious process which is a disincentive to making large numbers of crossing attempts. <i>Eragrostis tef</i> is an allotetraploid of which the diploid progenitors are unknown." ... "Interspecific hybridization with wild <i>Eragrostis</i> spp. has been tried, but success was obtained only with <i>Eragrostis pilosa</i> ; short-stature and early maturity were the favourable traits transferred to tef. <i>Eragrostis curvula</i> may potentially provide stalk strength and large seed size, but hybrids with tef do not set seed. Attempts are being made to construct a genetic linkage map for tef. Anther/microspore culture and subsequent breeding of double-haploid cultivars is also being attempted. Inter simple sequence repeats are more promising than other DNA-based markers for the quantification of genetic diversity and identification of tef genotypes. "
	Ketema, S. 1997. Tef. <i>Eragrostis tef</i> (Zucc.) Trotter. Promoting the conservation and use of underutilized and neglected crops. 12. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"Several attempts were made to investigate the possibility of crossing tef with other wild <i>Eragrostis</i> species. However, the attempt to make a cross between <i>E. tef</i> and <i>E. curvula</i> was not successful. Also, interspecific hybridization attempts using three tetraploids, i.e. <i>E. tef</i> x <i>E. cilianensis</i> (4x); <i>E. tef</i> x <i>E. pilosa</i> (4x); and <i>E. tef</i> x <i>E. minor</i> (4x) were not successful (Tavassoli 1986). Some barrier to gene exchange was suspected where it was not possible to develop a plant from the hybrid seed formed by crossing <i>E. tef</i> with <i>E. minor</i> (Tavassoli 1986)."

604	Self-compatible or apomictic	y
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Tef is predominantly self-pollinating, with a very low degree of outcrossing (up to 1%), and pollen is set free in the early morning."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Tef is predominantly self-pollinating, with a very low degree of outcrossing (up to 1%), and pollen is set free in the early morning. In the inflorescence floral maturity starts from the top and progresses downward, whereas in the spikelet it progresses from the base upward."

Qsn #	Question	Answer
606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	[Non-rhizomatous] "Annual, tufted grass, up to 150(–200) cm tall, with a shallow, fibrous root system; stem (culm) usually erect, simple or sparsely branched." ... "Tef is propagated by seed. There is no seed dormancy and germination is rapid."

607	Minimum generative time (years)	1
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Annual, tufted grass, up to 150(–200) cm tall, with a shallow, fibrous root system; stem (culm) usually erect, simple or sparsely branched." ... "Seeds mature within a month after pollination. The total growth cycle from sowing to maturity is 2–5(–6) months."
	FAO. 2016. Grassland Species Profiles - <i>Eragrostis tef</i> . http://www.fao.org/ag/agp/AGPC/doc/Gbase/data/Pf000247.HTM . [Accessed 29 Aug 2016]	"It matures in ten to 12 weeks."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Tef can be found as an escape from cultivation along roadsides and railway lines, and in dry grassland on sandy loam soils." [Possibly]

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Small-scale commercial tef production takes place in South Africa, the United States, Canada, Australia, Europe (the Netherlands) and Yemen. Tef is grown as a forage grass, for instance in South Africa, Morocco, Australia, India and Pakistan. It has been introduced experimentally into other tropical countries, either for its grain or for hay, e.g. in other parts of East Africa and in southern Africa."

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes

Qsn #	Question	Answer
	Ketema, S. 1997. Tef. <i>Eragrostis tef</i> (Zucc.) Trotter. Promoting the conservation and use of underutilized and neglected crops. 12. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[No evidence, but potentially if grown with other crops] "It is mainly cultivated as a monocrop, but occasionally under a multiple cropping system. In such cases it is usually grown as an intercrop with rapeseed (<i>Brassica napus</i>), safflower (<i>Carthamus tinctorius</i>) and sunflower (<i>Helianthus annuus</i>) or relay-cropped with maize (<i>Zea mays</i>) and sorghum (<i>Sorghum bicolor</i>). It is also cropped sequentially in a crop-rotation system in the mid- and high-altitude areas after chickpea (<i>Cicer arietinum</i>), field pea (<i>Pisum sativum</i>), faba bean (<i>Vicia faba</i>) and grass pea (<i>Lathyrus sativus</i>); while at low-and some mid-altitude areas it is 'grown after haricot bean (<i>Phaseolus vulgaris</i>). Usually a 4-5 year rotation cycle is practised. In a 4-year rotation cycle the sequence followed would be: pulse/tef/tef (or another cereal, for example, wheat or barley)/pulse. In a 5-year rotation cycle the sequence would be: pulse/tef/tef/other cereal/pulse."

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Ingram, A. L., & Doyle, J. J. (2003). The origin and evolution of <i>Eragrostis tef</i> (Poaceae) and related polyploids: evidence from nuclear waxy and plastid rps16. <i>American Journal of Botany</i> , 90(1), 116-122	"The two species are similar morphologically, and the only documented and consistent morphological distinction between <i>E. pilosa</i> and <i>E. tef</i> is spikelet shattering. The multi-floreted spikelets of <i>E. pilosa</i> readily break apart at maturity as a natural mechanism of seed dispersal, whereas the lemmas, paleas, and caryopses of <i>E. tef</i> remain attached to the rachis at maturity and thereby facilitate harvesting (Phillips, 1995)."

705	Propagules water dispersed	n
	Source(s)	Notes
	Ingram, A. L., & Doyle, J. J. (2003). The origin and evolution of <i>Eragrostis tef</i> (Poaceae) and related polyploids: evidence from nuclear waxy and plastid rps16. <i>American Journal of Botany</i> , 90(1), 116-122	[Possibly, but unlikely] "The multi-floreted spikelets of <i>E. pilosa</i> readily break apart at maturity as a natural mechanism of seed dispersal, whereas the lemmas, paleas, and caryopses of <i>E. tef</i> remain attached to the rachis at maturity and thereby facilitate harvesting (Phillips, 1995)."

706	Propagules bird dispersed	n
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Fruit a caryopsis (grain), ovoid to ellipsoid, 1–1.5 mm × 0.5–1 mm, yellowish-white to deep brown."
	Ingram, A. L., & Doyle, J. J. (2003). The origin and evolution of <i>Eragrostis tef</i> (Poaceae) and related polyploids: evidence from nuclear waxy and plastid rps16. <i>American Journal of Botany</i> , 90(1), 116-122	"The multi-floreted spikelets of <i>E. pilosa</i> readily break apart at maturity as a natural mechanism of seed dispersal, whereas the lemmas, paleas, and caryopses of <i>E. tef</i> remain attached to the rachis at maturity and thereby facilitate harvesting (Phillips, 1995)."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes

Qsn #	Question	Answer
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"Fruit a caryopsis (grain), ovoid to ellipsoid, 1–1.5 mm × 0.5–1 mm, yellowish-white to deep brown." [Small, but otherwise lack means of external attachment]
	Ingram, A. L., & Doyle, J. J. (2003). The origin and evolution of <i>Eragrostis tef</i> (Poaceae) and related polyploids: evidence from nuclear waxy and plastid rps16. <i>American Journal of Botany</i> , 90(1), 116-122	"The multi-floreted spikelets of <i>E. pilosa</i> readily break apart at maturity as a natural mechanism of seed dispersal, whereas the lemmas, paleas, and caryopses of <i>E. tef</i> remain attached to the rachis at maturity and thereby facilitate harvesting (Phillips, 1995). Because of its importance in allowing farmers to control seed dispersal, the transition from shattering to non-shattering is one of the most common traits altered during the domestication process (Heiser, 1973)."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Seman, R. (2007). Dung seed bank of livestock in Weberi Addis Ababa, Ethiopia. MSc Thesis. Addis Ababa University, Addis Ababa, Ethiopia	"A total of 7417 seedling from 41 species germinated which is equivalent to 206 germinations per kg of dung. The most abundantly and frequently recorded plant species were <i>Eragrostis tef</i> and <i>Trifolium tembense</i> and different Poaceae and Fabaceae species."
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"seed eaten by wildlife and cattle,"

801	Prolific seed production (>1000/m2)	y
	Source(s)	Notes
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	"The 1000-seed weight is 200–500 mg. A single inflorescence can produce over 1000 seeds and a single plant over 10,000 seeds."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	National Research Council. 1996. Lost Crops of Africa: Volume I: Grains. National Academy Press, Washington, D.C.	"The grain is easy to store and will survive for many years in traditional storehouses without damage by insects. This makes it a valuable safeguard against famine."
	Tefera, H. & Belay, G., 2006. <i>Eragrostis tef</i> (Zuccagni) Trotter. In: Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa), Wageningen, Netherlands	[Could potentially form a persistent seed bank in dry habitats] "Tef is propagated by seed. There is no seed dormancy and germination is rapid." ... "Tef seeds remain viable for several years provided direct contact with moisture and sunshine is avoided."

803	Well controlled by herbicides	y
	Source(s)	Notes

Qsn #	Question	Answer
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	[No information on control of <i>E. tef</i> , but herbicides used to control <i>Eragrostis curvula</i> would presumably be effective] "African lovegrass may also be controlled with herbicides. Spotspray with amitrole T, a flowable amitrole + atrazine mixture, or glyphosate, boomspraying the larger colonies. As these herbicides give total weed control, it is essential to replace the killed weed as soon as practicably by oversowing with a suitable perennial pasture, and topdressing as required to maintain a vigorous cover."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Miller, D. (2010). Teff Grass: Crop overview and forage production guide. Cal/West Seed Company. Woodland, CA	[Tolerates grazing & cutting] "Although best suited for haying operations, Teff can be grazed by cattle, horses and sheep. Avoid pasturing until the root system has developed, excess stocking rates and over-grazing. As with hay harvest, a 4-inch stubble is a must for quick regrowth." ... "Cutting at the proper time (prior to seed head appearance) ensures adequate plant reserves for regrowth in subsequent cuts. Harvesting after Teff has headed out will cause delays in regrowth. Cutting interval is generally 45 to 50 days for first cut and approximately 30 days for subsequent cuts; however this may vary by location. A stubble cutting height of 3 to 4 inches is necessary to promote vigorous regrowth."

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

Summary of Risk Traits:

High Risk / Undesirable Traits

- Broad climate suitability; elevation range exceeds 2000 m, demonstrating environmental versatility
- Grows in tropical climates
- Naturalized in a number of locations
- Designated as a weed of unspecified impacts
- Other *Eragrostis* species are invasive
- Tolerates many soil types
- Reproduces by seeds
- Self-pollinating
- Annual grass, reaching maturity in 2-6 months
- Seeds intentionally by people & in animal dung
- Prolific seed production
- Seeds may persist in the soil
- Tolerates grazing & mowing

Low Risk Traits

- Domesticated grass
- Unarmed (no spines, thorns or burrs)
- Provides fodder for livestock
- Grain crop
- Not reported to spread vegetatively
- Non-shattering Infructescence; seeds remain attached to the rachis at maturity & may limit accidental dispersal
- Herbicides, if needed, may provide effective control

Second Screening Results for Herbs or Low-stature life forms

(A) Reported as a weed of cultivated lands?> Unknown. Designated as a weed of unspecified impacts in a number of references
Outcome = Evaluate

