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RESEARCH ARTICLE

On-farm genetic diversity and distribution pattern of Enset (*Ensete ventricosum* (Welw.) Cheesman) cultivars in Gedeo Zone of Ethiopia

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Abstract

The objective of the study was to assess the status of Enset genetic diversity, distribution pattern and farmers' preference in cultivars utilization for food and non-food uses. Total of 232 household respondents were selected from seven study Kebeles using multi stage sampling techniques. Frequency and distribution pattern of enset cultivars varied across study sites. Frequency distribution of the cultivars varied from 3% (Telila) to 88.9% (Genticho). Regarding distribution, six cultivars were grown in all three agro-ecologies. Two and seven cultivars were limited to highland and midland, in that order. Eleven cultivars were limited to midland and highland areas. Cultivar richness (number of cultivars per farm) ranged from 5 to 19 (with mean of 18) in highland, 1 to 22 (14) in midland and 2 to 6 (with mean of 5) in lowland. Farmers were able to differentiate enset cultivars by their morphological characters. Highly vigorous and moderately vigorous cultivars accounted for 42.3% and 57.7%, respectively. For pseudo-stem color, 34.6% were green, 23.0% were light green, 30.8% were brown and 11.5% were red. For leaf size, cultivars with wider leaves accounted for 30.8% while the ones with narrow leaf were 69.2 %. Enset cultivars also varied in days to maturity and productivity. About 76.9% were late maturing (5 to 7 years) and 23% were early maturing (3 to 4 years). Three cultivars (11.5%) were high yielder, 16 (61.5%) medium and 7 (27%) were low yielder according to farmers. Farmers have developed preference in enset cultivars utilization for food (Kocho, Bulla and Amicho) and non-food uses (source of fibre and medicine). The farmers were able to rate the cultivars from fair to very good for food and non-food uses, indicating that farmers should be involved in the process of enset breeding. In general, this study revealed presence of high genetic diversity in local enset cultivars grown in Gedeo Zone. Specialty enset varieties for particular use can be developed using these local cultivars.

Key words: enset landraces, Gedeo Zone, genetic diversity, farmers' preference

Introduction

Enset (*Enseteventricosum* (Welw.) Cheesman) is corm crop and is native Ethiopia. The crop resembles banana. Enset differs from banana in many ways. The pseudo-stem of enset is dilated unlike banana which is slender throughout. Enset does not produce sucker, unless the apical meristem is eliminated (Oldeman, 1990). It also produces viable seed unlike banana. The consumable parts are corm and pseudo stem (Kippe, 2002). Enset is multipurpose crop. The crop supports 18 to 20 million people in Ethiopia (Tsegaye, 2002). Enset is source of food, feed, fiber, fuel wood and medicine.

The plant is consumed in the form of Kocho (obtained from a mixture of decorticated leaf sheath and corm after fermentation), Bulla (starchy product produced by squeezing the scrapped leaf sheath and corm), and Amicho (obtained from inner part of the corm and eaten after boiling, similar to potato). Particular cultivars and parts of enset plants are used as a source of medicine for to treat human and livestock (Brandt *et al*, 1997). Enset also plays great role in soil and water conservation (Kippe, 2002). Enset matures after three years. In addition to the afore mentioned benefits, the crop is drought tolerant and high yielder.for instance, single mature plant (at age of 6-7 years) produces about 47 kg of Kocho, 1kg Bula and 41 kg Amicho (CSA, 2017a). In Ethiopia, enset is grown in diverse agro-ecologies and with diverse farming system which results in high genetic diversity of the crop in the country. Enset is grown in altitudes ranging from 1,200 to 3,100 meter above sea level, temperature of 10 to 21^{o}C and relative humidity of 63 to 80%. Moreover, most enset-growing areas receive annual rainfall of about 1,100 to 1,500 meter above sea level (Tsegaye, 2002). The crop is mainly grown in South and south western part of the country. Enset production is limited to two regions. In 2016/17, Southern and Oromia regions respectively shared 70% and 30% of total enset produced in the country (CSA, 2018). In southern region, Gedeo Zone is the 2nd major enset producer Zone, after Sidama. Enset is staple food crop in the area and it has been grown for several centuries (Kippe, 2002). With enset area of 29,766 ha in 2016, Gedeo Zone accounted for 12.2% of national enset production. For instance, it shared about 33.5% of area under all crops (88,818 ha) in the Zone in 2016 (CSA, 2017a). The crop is grown throughout three agro-ecologies of Gedeo Zone namely highland (accounting for 25.5% of Zonal area), midland (72.3%) and moist lowland accounting for 2.2% of Zonal area. The topography of Gedeo Zone is undulating and crop farming systems differs across agro-ecologies. Enset area coverage is high in the highland followed by midland areas (Abiyot, 2013; Mesele and Niguisse, 2008). Gedeo Zone is highly suitable for enset production. Several local enset cultivars have been developed by farmers through selection. Almost 100% of enset farmers of the Zone use local cultivars due to shortage of improved enset varieties as well as lack of access to improved varieties (CSA, 2017 b). Land shortage due to high population density (Mesele, 2007; Kippe, 2002) and climate change (Bishaw *et al.*, 2013) are threat to enset biodiversity in the area. Local cultivars are heterogeneous in their genetic features and are source of desirable genes for crop genetic improvement including enset. Hence, there was a need to study status of enset plant biodiversity as to facilitate for germplasm collection, maintenance and utilization in enset breeding. Accordingly, this study was conducted with the objective to assess status of enset genetic diversity, distribution pattern and farmers' preference in cultivars utilization for food and non-food uses.

Materials and methods

Geographical site selection

The study was conducted in different agro-ecologies of Gedeo Zones in 2017. Gedeo is one of 13 administrative Zones in Southern Regional State. The Zone is situated at 5 to 7 degrees North latitude and 38 to 40 degrees East longitude. Dilla, capital town of Gedio Zone, is located at 87 Km south of regional capital city, Hawaasa. The population of Gedeo Zone as of 2017 were 1,148,517 (576,220 male and 572,292 Female) out of which 196,634 (17.1%) were urban dwellers. The area of Gedeo Zone is 1,210.89 km^2 (GZOED, 2019) with an annual rain fall of 760 to 1800 mm. The zone has three agro-ecologies. High land is 25.5%, midland (72.3%) and moist lowland (2.2%). The study

was conducted in two kebeles of Bule district (highland), two kebeles of Yirgacheffe (midland) and three kebeles of Dilla Zuria (lowland). Altitude range of highland, midland and lowland are 1751 to 2100, 1501 to 1750 and 1201 to 1500 m.a.s.l, in that order.

Figure: Map of Gedeo zone and study districts (star)

Sampling

Multistage sampling techniques were used to select 232 household respondents. First, three districts namely Bule, Yirgachefe and Dilla Zuria were purposely selected. They represent highland, midland and lowland agro-ecologies in Gedio Zone in that order. Then, two kebeles (Sika and HaroWelabo) representing highland, two kebeles (Wete and Bowcha) from midland and three Kebeles (Amba, Harsu and Aroresa) from lowland were rondomly selected. Finally, 242 household respondents representing 10% of enset grower households in the seven Kebeles were randomly selected for the study. Individual interview using structured and semi-structured questionnaire and field visit were carried out. Data collected by individual interview were household and socioeconomic characters (sex, age and land size) and enset cultivars grown by respondent. Landraces grown by each respondent farmer was determined by marking a presence-or-absence. Characteristics of each landrace such as maturity period, yield, plant vigour, Pseudo-stem color and leaf size were recorded. Particular uses (food and non-food uses) of enset landraces and farmers preference for landraces for each use were recorded through individual interview as well as group discussion. The collected data were analysed using excel and SAS.

Results and discussion

Household characteristics of the respondents are presented in Table 1. Most (83.5%) of the respondents were male and 16.5% were females. Regarding age of the respondents, 53.9%, 41.7%, 3.9% and 0.4% were between 20 and 40, 41 and 60, 61 and 80 and above 80 years of age, respectively. The minimum age of respondents was 22, the maximum was 94 and the average was 43. The average land size was 1.1ha and it varied from 0.04ha in Haru and 5.0ha in HaroWelabo. The result of this survey revealed that land size per holder is negatively correlated with altitude. The average land size of respondents in Bule district (highland) was 1.35ha, Yirgachefe (midland) 1.25ha and Dilla Zuria 0.8ha.

Diversity and distribution of enset cultivars

Total of 26 enset cultivars were recorded in Gedeo Zone (Table 2). Number of cultivars recorded in highland, midland and lowland were 20, 24 and 6, respectively. Six enset cultivars (*Astara-nech, Astara-key, Dembale, Genticho, Harame and Torame*) were recorded in all of the three agro-ecologies. This indicates some enset landraces have wider adaptation and also more preferred by enset farmers in Gedio Zone. On the other hand, seven cultivars (*Denka, Kosha, Miqi, Qorqoro, Shana, Tilila and Wekeso*) were limited to midland area; while two (Gecha and Medalacho) were limited to highland. Eleven enset cultivars (*Ado, Agena, Burtukan, Dimoye, Gasola, Genta, Kake, Mundoye, Nifo, Qarase and Toracho*) were recorded in midland and highland agro-ecologies of the Zone.

Frequency/abundance of enset cultivars

Abundance of cultivar in this case refers to number of farm in which the cultivar is grown. In this study, some cultivars were abundant and widely distributed (Table2 and Fig2). The top 10 abundant cultivars in Gedeo Zone were *Ganticho* (grown by 88% of 232 household respondent) followed by *Astara-key* (85.1%), *Torame* (83.1%), *Dembele* (81.4%), *Qarase* (76.4%), *Nifo* (75.6%) and *Astara-nech* (74.0%), *Harame* (69%), *Mundoye* (63.2%) and *Dimoye* (61.6%). On the contrary, *Tilila, Miqi* and *Shana* were grown by 2.9%, 10.7% and 15.3% of respondents. All three were limited to midland. Abundant landraces were widely distributed.

On-farm cultivars richness

Number of landraces per farm varied from 1 at Bowcha to 22 at Wete and with mean of about 6 cultivars per farm (Table 3). On-farm cultivars richness in highland ranged from 5 to 19 with average of about 18. In midland, it was from 1 to 22 and with mean of about 14 cultivars per farm. In lowland, cultivars richness varied from 2 to 6. On-farm cultivar richness increased with altitude. This might be due to availability of land in the highland.

Table 1: Household characteristics of respondents

		Sex			Age (year)			Land size (ha)		
District	**Study sites**	**M**	**F**	**Total**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**
Bule	Sika	25	4	29	22	75	41.8	0.40	3.00	1.01
	Haro Wrlabu	30	3	33	25	50	36.0	0.38	5.00	1.60
Yirgacheffe	Wete	75	11	86	31	81	45.0	0.27	2.50	1.10
	Bowcha	50	6	56	22	70	38.0	0.25	3.00	1.40
Dilla Zuria	Amba	7	5	12	35	55	45.5	1.00	4.00	2.04
	Harsu	7	3	10	28	57	41.0	0.04	2.00	0.37
	Haroressa	3	3	6	32	94	54.0	0.06	0.25	0.15
Over all		**197**	**35**	**232**	**22**	**94**	**43.0**	**0.04**	**5.00**	**1.10**

Table 2: Percentage of respondents growing enset cultivars by study sites

SN	Lndraces	Bule District		Y/chefe District		Dilla Zuria District			Mean (N=232)
		Sika (N=29)	Harowalabu (N=33)	Wete (N=86)	Bowcha (N=56)	Amba (N=12)	Harsu (N=10)	Haroresa (N=6)	
1	Ado	59.0	93.9	74.4	7.1	-	-	-	50.4
2	Agena	61.5	97.0	100.0	-	-	-	-	60.3
3	Astara keyi	61.5	97.0	100.0	69.6	91.7	90.0	83.3	85.1
4	Astara Nechi	61.5	97.0	100.0	21.4	91.7	90.0	83.3	74.0
5	Burtukan	59.0	93.9	33.7	14.3	-	-	-	37.6
6	Dembele	64.1	100.0	93.0	60.7	91.7	90.0	83.3	81.4
7	Denka	-	-	97.7	7.1	-	-	-	36.4
8	Dimoye	61.5	97.0	100.0	12.5	-	-	-	61.6
9	Ganticho	64.1	100.0	100.0	73.2	100.0	100.0	100.0	88.0
10	Gasola	59.0	93.9	58.1	8.9	-	-	-	45.0
11	Gecha	59.0	93.9	-	-	-	-	-	22.3
12	Genta	64.1	100.0	-	3.6	-	-	-	24.8
13	Harame	61.5	97.0	100.0	-	91.7	90.0	83.3	69.0
14	Kake	61.5	97.0	100.0	7.1	-	-	-	60.3
15	Kosha	-	-	54.7	12.5			-	22.3
16	Medalacho	59.0	93.9		-	-	-	-	22.3
17	Miqi	-	-	30.2	-	-	-	-	10.7
18	Mundoye	61.5	97.0	100.0	19.6	-	-	-	63.2
19	Nifo	64.1	100.0	100.0	69.6	-	-	-	75.6
20	Qarase	61.5	97.0	100.0	76.8	-	-	-	76.4
21	Qorqoro	-	-	100.0	23.2	-	-	-	40.9
22	Shana	-	-	43.0	-	-	-	-	15.3
23	Tilila			7.0	1.8	-	-	-	2.9
24	Toracho	64.1	100.0	100.0	14.3	-	-	-	62.8
25	Torame	61.5	97.0	100.0	58.9	100.0	100.0	100.0	83.9
26	Wekeso	-	-	79.1	-	-	-	-	28.1

Note: N refers to number of respondents

Figure 2: Relationships between abundance and distribution of cultivars (r=0.88, P<0.001)

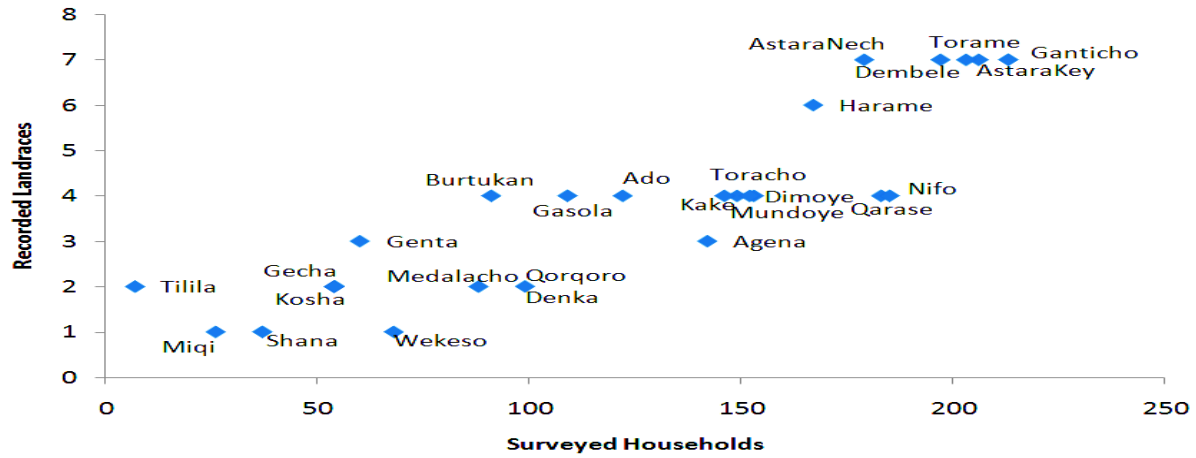

Table 3: Number of Enset landraces/ farm (richness) by agro-ecology of Gedeo Zone

District	SN	Kebele	Min	Max	Range	Mean
Bule (Highland)	1	Sika	5	19	14	18.2
	2	HaroWelabo	5	19	14	18.4
		Mean	**5**	**19**	**14**	**18.3**
Yirgachefe (Midland)	1	Wete	15	22	7	18.7
	2	Bowcha	1	12	11	5.6
		Mean	**1**	**22**	**21**	**13.5**
DillaZuria (Lowland)	1	Amba	2	6	4	5.7
	2	Harsu	2	6	4	5.6
	3	Haroresa	2	6	4	5.3
		Mean	**2**	**6**	**4**	**5.6**
Overall			**1**	**22**	**21**	**11.1**

Note: Total of 26 landraces were recorded

Number of shared cultivars between study sites

Number of shared cultivars between study sites ranged from 5 to19 (Table 4). Sika Kebele of Bule district and Wete Kebele of Yirgachefe district shared 19 landraces which is about 73.1 % of landraces identified during the study period. This shows that there has been high enset germplasm exchange between the two districts. On the other hand the three studied Kebeles in Dilla Zuria shared all 6 landraces with all other Kebeles except Bowcha of Yirgachefe. This shows that the 6 enset landraces are highly preferred by farmers in Gedio Zone. According to respondents, Dembele, Torame, Ganticho and Harame give high Kocho yield. Astara-key and Astara-nech produce quality kocho and also used as fermentation starter in Kocho processing.

Phenotypic characters of Enset cultivars

Farmers classified enset cultivars based on phenotype (Table5). Majority (76.9%), 23.1% were late maturing and early maturing in that order. Three cultivars (11.5%) were high yielder, 16 (61.5%) medium and 7 (27%) were low yielder. High yielder cultivars are late maturing and vigorous. Based on plant vigour, highly vigorous and moderately vigorous cultivars accounted for 42.3% (11 cultivars) and 57.7% (15), respectively. Based on color of pseudo-stem, 34.6% (9) were green, 23.1% (6) were light green, 30.8% (8) were deep brown and 11.5 % (3) were red. Based on leaf size, cultivars with wider leaves accounted for 30.8% (8 cultivars) and the remaining 18 cultivars (69.2 %.) had narrow leaves.

Farmers' preference for food uses

Three types of food are prepared from enset. These are bulla (starchy product obtained by squeezing the scrapped leaf sheath and corm), amicho (inner part of the corm eaten boiled similar to sweet potato) and kocho (fermented material obtained from a mixture of decorticated leaf sheath and corm). Enset cultivars vary in quality of these different food types, according to farmers. Hence, farmers were able to classify the enset cultivars as very good, good and fair for particular food types (Table 6). Two cultivars namely Ado and Toracho are good for all three (Bulla, Amicho and Kocho) food types. Gasola and Madalacho are good for Bulla and Kocho. Astarakey and AstaraNech are good for Amicho and Kocho. Ten landraces namely Agena, Dembele, Gecha, Genta, Harame, Mundoye, Qorqoro, Shana, Tilila and Torame are good for all the three types of food production. Kake is good for Bulla and Amicho but fair for Kocho. Genticho is very good for Bulla and Kocho but it is fair for Amicho.

Nifo is very good, good and fair for Bulla, Kocho and Amicho respectively. Six landraces namely Burtukan, Denka, Kosha, Miqi, Qarase and Wekeso are fair for all three food type production. Dimoye is good for Kocho but fair for Bulla and Amicho. This indicates that some enset landraces meet test preferences of farmers when used as food in different forms and other landraces are superior when utilized in one form. In other Enset producing Zones also enset clones are selected based on their specific use and utilization purposes (Brandt *et al.*, 1997; Tesfaye, 2002).

Farmers' preference for non-food uses

On the other hand, enset has several non-food uses (Table 7). It is source of fibre and medicine. Some enset cultivars are also preferred to hasten fermentation in kocho processing. Ado, *Ganticho* and *Toracho* are highly preferred for fibre production and are also used to treat human ailments. Dembale, Mundoye and Dimoye are moderately preferred as source of fibre and have no medicinal value. *Gecha, Genta, Qorqora* and *Shana* are moderately preferred for fiber and have been also used to treat human illness. Landraces namely *Gasola, Nifo, Agena, Harame, Tlila, Burtukan, Denka, Kosha, Miqi* and *Wekeso* are less preferred for fibre and have no medical use. *Astarakey*, *Astaranech* and *Qarase* are moderately preferred for fibre and have been used to treat human illness. Kake is not used for fiber production but it has medicinal value to treat human ailments. *Torame* and *Medalacho* are used to treat human and animal diseases, respectively. Both are not preferred for fibre production.

Enset landraces namely Ado and *Toracho* are superior for all three food types (Kocho, Bula and Amicho) and highly preferred for fibre production too. They are also used to treat human diseases. This indicates that some enset landraces have all hereditary traits that are desired by enset growers. Cultivar diversity reflected a variety of uses and differential performance against a multitude of production criteria (Brandt *et al.*, 1997).

Different researchers reported presence of many named enset cultivars in different parts of the country. For instance, Bizuayehu and Ludders (2003) recorded 86 enset cultivars in Sidama Regional State neighboring Gedio Zone. Five cultivars (Ado, Agena, Astara, Gasola and Genticho) recorded by the researchers in Sidama Zone are also reported to be grown in Gedeo Zone, indicating presence of farmer to farmer planting material exchange. In other studies, Yemataw (2016) recorded 75 enset landraces in Dawro, 63 in Gurage, 66 in Kembata-Tembaro and 69 in Siltie Zones. Likewise, Alemu and Sandford (1991) reported 44 enset landraces in Gamo Goffa, 17 in Segen Peoples and 111 in Wolaita Zones. Moreover, total of 59 named enset landraces was reported in Hadiya (Tsegaye (2002), 65 in Kaffa (Negash, 2001), 69 in Sheka (Belachew *et al.*, 2017) and 76 in Ari, South Omo (Shigeta, 1990). Moreover, presence of high genetic diversity was reported in coffee (Dawit *et al.*, 2020) which is also native to Ethiopia.

Table 4: Number of shared landraces by study sites (above diagonal), share in % (below diagonal)

	Bule District		**Yirgachefe district**		**DillaZuria District**		
Kebeles	Sika	HaroWelabo	Wete	Bowch	Amba	Harsu	Haroresa
Sika		19	16	15	6	6	6
HaroWelabo	73.1 %		19	15	6	6	6
Wete	61.5%	73.1%		18	6	6	6
Bowcha	57.7%	57.7%	69.2%		5	5	5
Amba	23.1%	23.1%	23.1%	19.2%		6	6
Harsu	23.1%	23.1%	23.1%	19.2%	23.1%		6
Haroresa	23.1%	23.1%	23.1%	19.2%	23.1%	23.1%	

Table 5: Phenotypic characters of Enset cultivars grown in Gedeo Zone

S.No.	Enset Cultivar	Maturity group	Yield per plant	Plant vigor	Pseudo-stem color	Leaf width
1	Ado	Late	High	High	Light green	Wide
2	Agena	Late	Medium	Medium	Deep brown	Narrow
3	Astarakeyi	Early	Medium	Medium	Deep brown	Narrow
4	AstaraNechi	Early	Medium	Medium	Light green	Narrow
5	Burtukan	Late	Low	High	Deep brown	Narrow
6	Dembele	Early	Medium	Medium	Green	Wide
7	Denka	Early	Low	High	Red	Narrow
8	Dimoye	Late	Low	High	Red	Narrow
9	Ganticho	Late	High	High	Deep brown	Wide
10	Gasola	Late	Medium	High	Red	Narrow
11	Gecha	Late	Medium	Medium	Deep brown	Narrow
12	Genta	Late	Medium	Medium	Deep brown	Narrow
13	Harame	Early	Medium	Medium	Light green	Narrow
14	Kake	Late	Medium	Medium	Deep brown	Narrow
15	Kosha	Late	Low	High	Green	Narrow
16	Medalacho	Late	Medium	Medium	Green	Wide
17	Miqi	Late	Low	High	Green	Narrow
18	Mundoye	Late	Medium	High	Deep brown	Narrow
19	Nifo	Early	Medium	Medium	Green	Narrow
20	Qarase	Late	Low	Medium	Green	Narrow
21	Qorqoro	Late	Medium	Medium	Light green	Wide
22	Shana	Late	Medium	Medium	Light green	Wide
23	Tilila	Late	Medium	Medium	Light green	Wide
24	Toracho	Late	High	High	Green	Wide
25	Torame	Late	Medium	Medium	Green	Narrow
26	Wekeso	Late	Low	High	Green	Narrow

Table 6: Farmers' preference for Enset landraces based on food uses

S.No.	Landrace	Bulla	Amicho	Kocho	SN	Landrace	Bulla	Amicho	Kocho
1	Ado	1	1	1	14	Kake	2	2	3
2	Agena	2	2	2	15	Kosha	3	3	3
3	Astarakeyi	2	1	1	16	Medalacho	1	2	1
4	Astaranechi	2	1	1	17	Miqi	3	3	3
5	Burtukan	3	3	3	18	Mundoye	2	2	2
6	Dembele	2	2	2	19	Nifo	1	3	2
7	Denka	3	3	3	20	Qarase	3	3	3
8	Dimoye	3	3	2	21	Qorqoro	2	2	2
9	Ganticho	1	3	1	22	Shana	2	2	2
10	Gasola	1	2	1	23	Tilila	2	2	2
11	Gecha	2	2	2	24	Toracho	1	1	1
12	Genta	2	2	2	25	Torame	2	2	2
13	Harame	2	2	2	26	Wekeso	3	3	3

Key: 1-very good, 2- good and 3- fair

Table 7: Enset landraces preferred for on non-food uses

Use type		Number	%	List of cultivars
1	Fiber	3	11.5	Ganticho, Toracho and Ado
2	Source of medicine	9	34.6	Qarase, Medalacho, Qorqoro, Shana, Gecha, Genta, AstaraNechi, Astarakeyi and Kake
3	Fermentation starter	4	15.4	Astara, Qarase, Ganticho, Agena and others

Conclusion

Total of 26 named enset cultivars were recorded. Frequency and distribution pattern of enset cultivars varied across study sites. Frequency distribution of the cultivars varied from 3% (Telila) to 88.9% (Genticho). Six cultivars were grown in all three agro-ecologies. Two and seven cultivars were limited to highland and midland, in that order. Eleven cultivars were limited to midland and highland areas. Cultivar richness (number of cultivars per farm) ranged from 5 to 19 (with mean of 18) in highland, 1 to 22 (14) in midland and 2 to 6 (with mean of 5) in lowland. Number of shared cultivars between study sites varied from 5 to 19. Farmers were able to differentiate enset cultivars by their morphological characters such as plant vigor, pseud-stem color and leaf size. The enset cultivars also vary in in days to maturity and productivity. Farmers have developed preference in enset cultivars utilization for food (Kocho, Bulla and Amicho) and non-food uses (source of fiber and medicine) indicating that farmers should be involved in the process of enset breeding. In general, there is high genetic diversity in local enset cultivars grown in Gedeo Zone. Specialty enset varieties for particular use can be developed using the enset cultivars based on farmers' preference in cultivar utilization for food and non-food uses. Hence, it is a matter of urgency to collect and maintain these valuable genetic resources to protect from genetic erosion as well as for utilization in enset breeding. It is highly advisable to characterize and evaluate the enset cultivars for agro-morphological characters, for further utilization.

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