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of Bananas (*Musa spp.*) and Enset (*Ensete ventricosum*)
in East African Highland

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Ethnobotanical Study of Local Practices Maintaining Landrace Diversity of Bananas (*Musa* spp.) and Enset (*Ensete ventricosum*) in East African Highland

Yasuaki Sato^{*}

1. Introduction

This paper focuses on local practices maintaining landrace diversity of two similar crops; banana (*Musa* spp.) and enset (*Ensete ventricosum*). Banana is indispensable staple food crop in parts of the Great Lakes region of East Africa, including Uganda, Tanzania, Kenya, Rwanda, Burundi, and the eastern Democratic Republic of Congo. Enset is also fundamental to subsistence economies as staple food in the southwestern part of the Ethiopian highlands. Both crops embrace great morphological varieties in the East African Highland. For example, people keep 72 landraces of bananas in a Haya village of Tanzania (Maruo 2002), 78 landraces of enset in Ari Area of Ethiopia (Shigeta 1988), 64 of enset in Maro area of Ethiopia (Fujimoto 1997) and 86 of enset in Sidama area of Ethiopia (Tesfaye and Ludders 2003).

Landrace diversity of crops are often found in some agricultural systems of "peripheral" area in the world. Since last half of the Twentieth Century, international societies, nations, companies and even local communities have regarded the landraces as irreplaceable resources. They have watched and warned the decline of the diversity through change of agricultural situation. Landraces have been widely reputed to be a shared asset of all humanity in the context of biodiversity issue. In addition to that, landraces are necessary for breed improvement of crops by researchers.

Various organization and groups have become active in conservation of landraces through farmers' management (*in situ* conservation) since 1990s as well as preservation of germplasm in gene banks (*ex situ* conservation). The study to prove that the biodiversity contributes the sustainability of the agriculture (cf. Brush 1986) has supported that idea. It follows that a landrace has become an object that the different various views and value overlap, and sometimes conflict between each other. Nishikawa (2005) pointed a reason of difficulty to find the common foundation for discussion of genetic resources. He explained that landrace issue is mixture of different viewpoints which regard a genetic resource as like public goods, or which insist on the protect of them through utilization as

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private goods.

The mechanism of diversification or maintenance landraces in local community needs anthropological approach. Studies on the role of human activities and indigenous knowledge on landrace diversity still leave unexplained questions. The diversification of the traits of domesticated plants and their maintenance depend on the inter-relationships between human and plants. Above all, human intervention can be seen as essential for understanding the biodiversity.

This paper has two objectives. The first is to report the field survey of local practices on enset landraces in Sidama, southwestern Ethiopia. The second is to make an ethnobotanical comparison of maintenance of landrace diversity among local community between bananas and enset in East African highland.

2. Banana and enset in Africa (Sato and Shigeta 2006; Shigeta and Sato 2006)

Both banana and enset are herbaceous perennials in the Family Musaceae (Order Zingiberales). They develop underground corms, "pseudostems" formed by the assembly of leaf sheaths above ground, and numerous large leaves. The plants sometimes grow 5 m or more in height. Enset tends to have larger underground corms and thicker leaves that stand more vertically than those of bananas. Inflorescence morphology is the key character that distinguishes landraces and also reflects the domestication process of the crops.

The eatable parts of the two crops are different from each other. We eat fruits of bananas that produced in 1-2 years from transplantation. On the other hand, the eatable part of enset is pseudostem and corm, that can be harvested any time in its life.

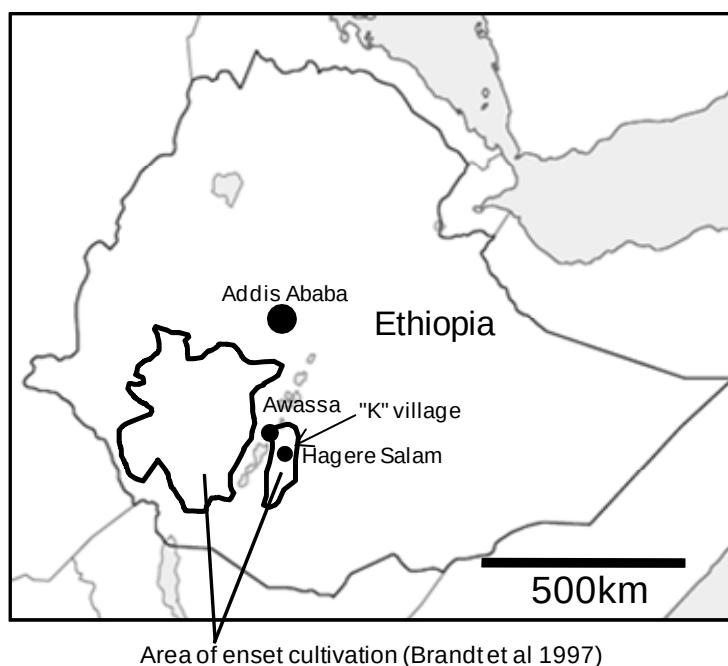
Agricultural systems of banana and enset in Africa are broadly classified into four types. Each system corresponds to each area. This paper discusses on two systems. One is Great Lake Region of East Africa, that is at 1,000-2,200m above the sea level. The other is the southwestern Ethiopia, that is at 1,500m-3,000m above the sea level. They have developed livelihood systems which are based on banana or enset cultivation, wherein each dwelling is surrounded by a garden which is dominated by either crop. Interdependence between people's life and the crops has created such unique landscapes.

3. Field survey on enset in Ethiopia

3.1 Research site

The study was conducted on February 2008 at a settlement in "K" village in Sidama zone, southwestern Ethiopia. Majority of Sidama zone are Sidama people, who speak a Cushitic language. Regional centre of Sidama zone is Awassa town. The nearest town of the research site is Hagere Salam. Awssa, Hagere Salam, and "K" village have an altitude of 1,680m, 2,800m and 2,710m each. Hagere Salam is about four hours away from Awassa by bus. "K" village is located 5 km northwest from Hagere Salam.

Figure 1: Research Site



"K" village is in densely-populated enset growing area. Tsegaye and Struik (2002) estimated population density of their research site around Hagere Salam as 299 persons km^{-2} . In generally, enset growing area in Ethiopia has scattered pattern of houses, though, the research settlement has a settlement pattern. Many of the members in the settlement are relatives. They share front yard of the houses to use the space for common nursery bed of enset. It can be notable situation, because there are no report on such a case in banana cultivation of Africa.

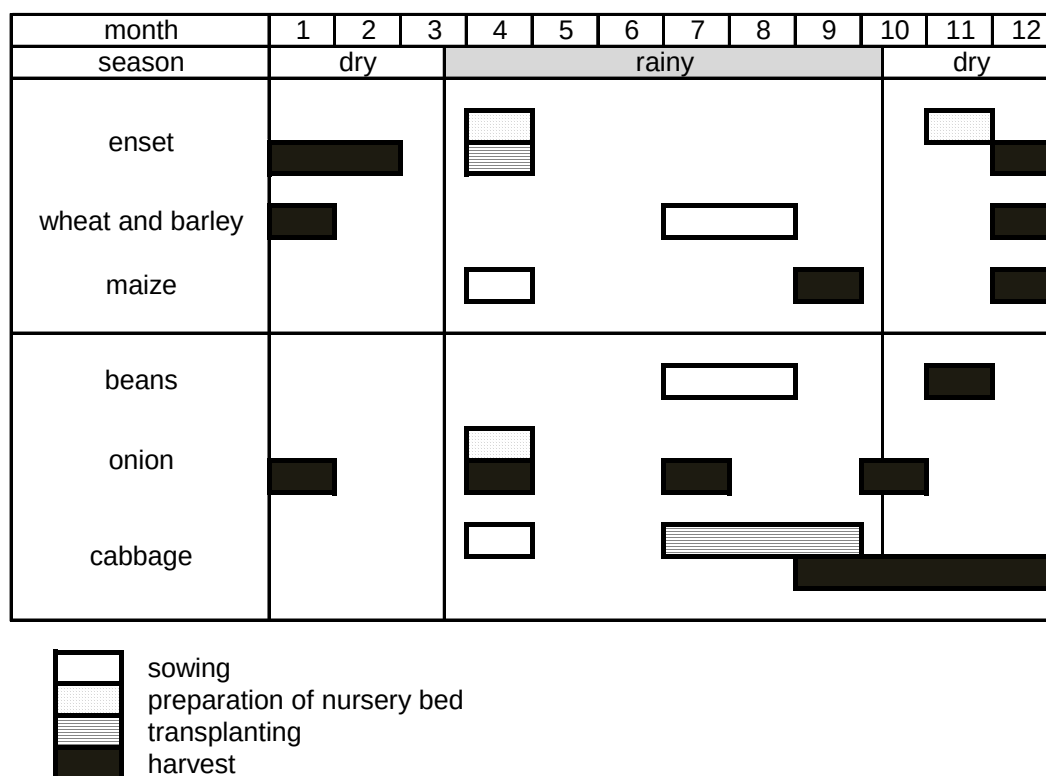
3.2 Methodology

The research includes interviews and participatory observation. On each household, interviews were conducted with the head of household or the person responsible for maintenance of the enset garden. The respondents named all of the enset landraces that they were currently growing. Data of agricultural calendar, land use pattern and management of enset seedlings were collected from some of households. Mr. T (25 years old) who had worked at Forest Department of Ethiopia Government translated from Sidama language into English. He assisted this survey for all period of time.

3.3 Agricultural pattern in the highland of Sidama

Figure 2 is the agricultural calendar based on the interview. Every household cultivates enset (singular: *waasa*, plural: *wasuwa* or *waassa*), wheat (singular: *sindecho*, plural:

Figure 2: Agricultural Calendar



sinde), barley (singular: *hayticho*, plural: *hayte*) and maize (singular: *badalacho*, plural: *badala*) as main staple food crops. They raise cattle and horses. Enset is regarded as their principal food among the crops. This calendar shows that they have limited period of transplanting and harvest. The sowing and harvest period of wheat, barley and maize are overlapped. At harvest period of enset, they scrape leaf sheaths and grate corm. After that, they ferment the starch for several months. The enset dishes that I observed are as follows; (1) *tima*, a pancake-like bread, (2) *omolicho*, rightly cooked crape, and (3) *bulusame*, flour mixed with butter and salt.

Beans, kale and onions are grown for side dishes. Enset, kale and onion are sold at the periodical market at Hagere Salam and on the roads. Revenue agent at the market place separated only the area where people trade in large amount of enset starch with a fence in order to collect tax.

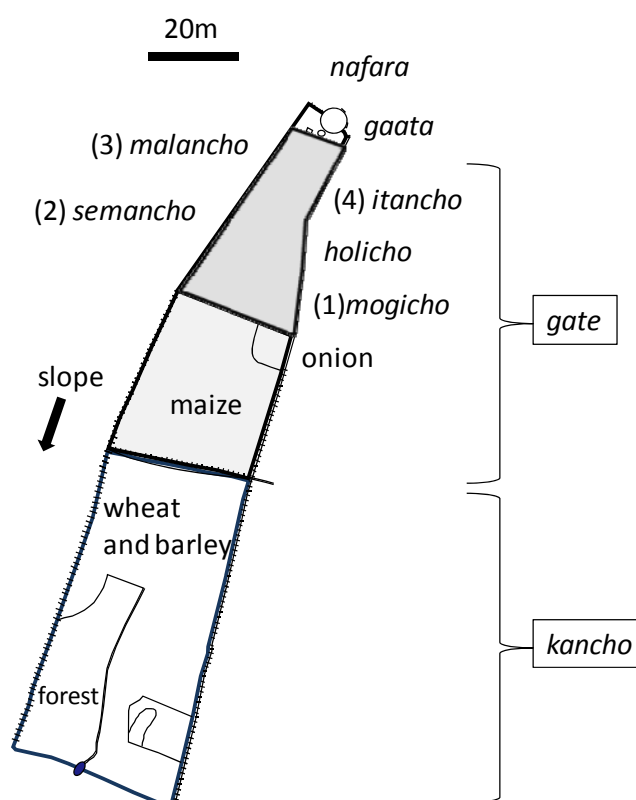
There are clear sexual division of labour according to crops as Table 1. About enset, both

men and women engage the work. The transplanting is men initiative, and the harvest is only carried out by women.

Table 1: Sexual division of labour according to crops

	kind of work	only men's work	rather men's work	rather women's work	only women's work
enset	transplanting		○		
	careing of plant		○		
	harvest				○
maize	sowing	○			
	weeding		○		
	harvest	○			
wheat and barley	sowing	○			
	harvest	○			
beans	sowing	○			
	harvest	○			
onion	(all)		○		
cabbage	(all)			○	

Figure 3: Map of land use of a household



In the highland of Sidama, many of the households use narrow pieces of land along the slopes. Figure 3 shows the spatial pattern of land use of a household. The front of the

house is *nafara* side. The land slopes to counter side. Bottom area of the hill are used as common range for grazing. A plot of each household is divided as a house (*gaata*), front yard (*nafara*), backyard (*gate*) and the area out of them (*kancho*). *gaata* and *nafara* are surrounded by fences of plants. *nafara* is where are few plants except to a few trees and a lawn. Parts of *kancho* are also separated with a fence. *kancho* includes cereal fields, forests and unused areas.

Enset must be planted in *gate*. Some cereals and vegetables are also planted there. It is subdivided into several plots where growing stages of enset are different from each other as follows; (1) *mogicho*, from one to two years after transplanting, (2) *semancho*, from two years to three years, (3) *malancho*, four years or after transplanting, etc. They transplant each plant only once, so a plot changes the name every year. This system of cultivation implies that enset can be managed not only individual plants but also groups in a garden. This kind of practice is not adopted in cultivation of banana in Africa.

A Young man starts their own cultivation from making *gate* at first. Sidama people take virilocal marriage system. He plants enset at a plot of parents before his independent, and he is granted the land after elders' approval. *gate* is also strongly imaged with the feeling of wealth or jealousy. For example, there are often a big enset plant with reddish pseudostem in front of houses. People explain that the reason is to avert evil eye. If the eyes watch the big enset garden, the harvest from it can shrink, they say.

3.4 Landraces of Households

According to the interview, the number of cultivated landraces came to 32. Examples of parts for their distinguishing and their characteristic are as follows. *ganticha* (a name of landrace): There are black spots inside of pseudostem. *keticho*: The pseudostem is no blackish. The base of pseudostem is bigger than *midasho*, the most popular landrace. *qeshicho*: The pseudostem is not blackish. It grows fast. *ado*: White powder is on the pseudostem. *boluticho*: It becomes the largest. *gulumo*: The petioles are reddish.

Most of these characteristics are common in those of bananas for people in Uganda to distinguish the landraces, for instance, blackish pseudostem, white powder on pseudostem, size and reddish petiole. Although, the range of morphological variation of enset is different from that of bananas. The variations in pseudostem and petiole of enset seem wider than those of banana. It is easier to distinguish landraces of enset than those of bananas even for outsider. On the other hand, there is much variation in shape of bunch or fruits between landraces of banana. The morphological variation of fruits of enset is not known because there are few flowering plants in gardens. Study of morphology classification or molecular biology will be able to prove these findings.

Table 2 is the data of the landraces that 17 interviewed households cultivated. There seems some landraces with different names. As a matter of convenience, they were counted one landrace. Household A, B, C, D, E, F, G and H made a settlement. Their front yards (*nafara*) were combined together and a common nursery bed of enset were managed there. Heads of household A, E, F, G, H, I and J are brothers or uncle-nephew each other. Relationships of other households were unknown. Each household from I to G prepares each nursery bed of enset.

In all, the average number of landrace is 13.9. There is no correlation between length of management and number of landraces in the garden. For example, the lengths of management in Household H and Q are 45 years and above 30 years each, but they have only 4 and 11 landraces each.

Figure 4 shows the data in decreasing order. There are much variations between households, that may reflects the diverse patterns of selection by each household. In the case of households that shared nursery bed, the number of landraces is small. They tend to cultivate only particular landraces.

Figure 5 shows how many households by which each landrace was cultivated. The original data is same as Table 2 and Figure 4. There is a gradual change in variation from the popular landraces to unpopular landraces. This feature is similar as the banana's case. Most landraces in common nursery bed in 2007 were popular ones. Figure 5 also shows there are a few popular landraces that all of the households cultivate. A farmer explained that they had grow *midasho* and *ganticha* from long ago, so all households planted them.

It is not clear whether people have strong selection criteria or not. There are no evidence that they put high value to the landrace diversity itself. This fact partly supports the suggestion of Shigeta (1988) that the unique selection mode of human being is a engine of diversification of landraces.

3.5 Exchange of Seedlings

8 households out of 17 form a group (or a company) that they take care seedlings of enset in the nursery bed together. It has established in 1995. The youth in the village proposed the idea, which is based on their principle "We will develop equally." The local government decided financial support, and people started the activity. If a household join the group, it must contribute 10 suckers per household member of 10 years old or above. They are allowed to contribute any kind of landrace. Half of suckers in the nursery were carried by truck and sold to lowland area. They distribute the benefit equally. In 2007,

The price of sucker of 1 hogobo (amount carried by a horse) is 30 birr (1 birr = about 10 Japanese yen).

Table 2: Landraces of households

household ID	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
number of wife(person)	1	2	1	1	1	1	1	2	1	1	1	1	2	2	1	1	2
number of children (person)	2	5,4	5	4	6	7	6	3,?	5	4	1	5	5,2	6,0	2	1	8,?
management period of onset garden (years)	11	31 or 32	unknown	14	30	unknown	unknown	45	unknown	unknown	more than 30	unknown	unknown	unknown	about 30	unknown	about 34
<i>midasho</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>ganicha, ganticho</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>gulumo</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>keticho</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>birra</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>gosallo</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>qeshicha, qeshicho</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>ado</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>darashite, darashi ado</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>bolucho</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>alatico</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>kulle</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>ancle</i>																	
<i>mitcho</i>			1		1	1			1				1				1
<i>uwisho</i>			1		1						1	1	1	1	1		
<i>lemicho</i>			1						1								
<i>fakushicho</i>																	
<i>qeshe</i>										1							
<i>boluborrancho</i>												1					
<i>adara</i>		1		1													
<i>damalla, damallo</i>		1		1											1		
<i>sharte</i>											1	1	1	1			
<i>shirra</i>									1	1							
<i>mundirara</i>									1	1							
<i>agana</i>									1	1					1		
<i>haho</i>									1	1							
<i>gadime</i>									1	1							
<i>garubo</i>									1	1							
<i>nifo</i>									1	1							
<i>chacho</i>		1							1	1						1	
<i>asutara</i>									1	1							
<i>goloma</i>																	
number of landraces	13	13	13	12	11	11	6	4	21	15	23	22	22	19	11	11	10

Figure 4: Number of landraces in households

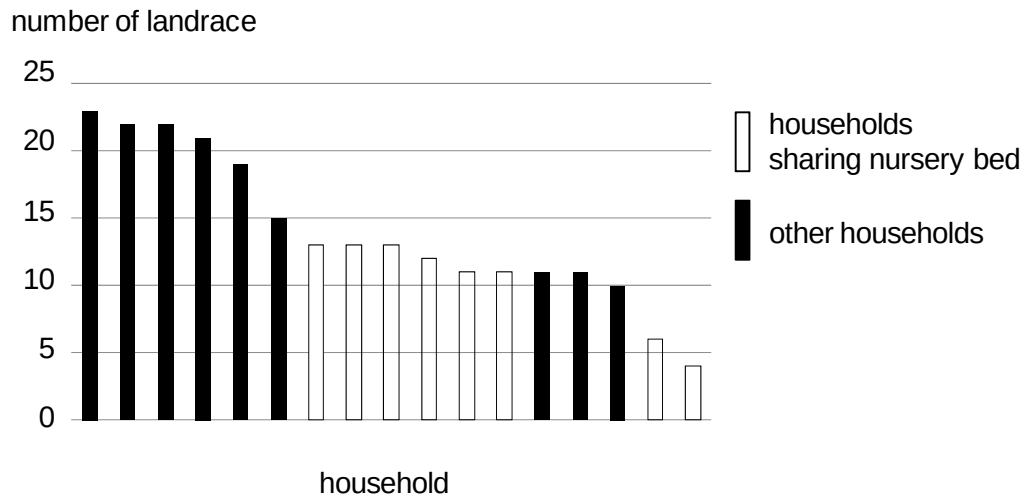
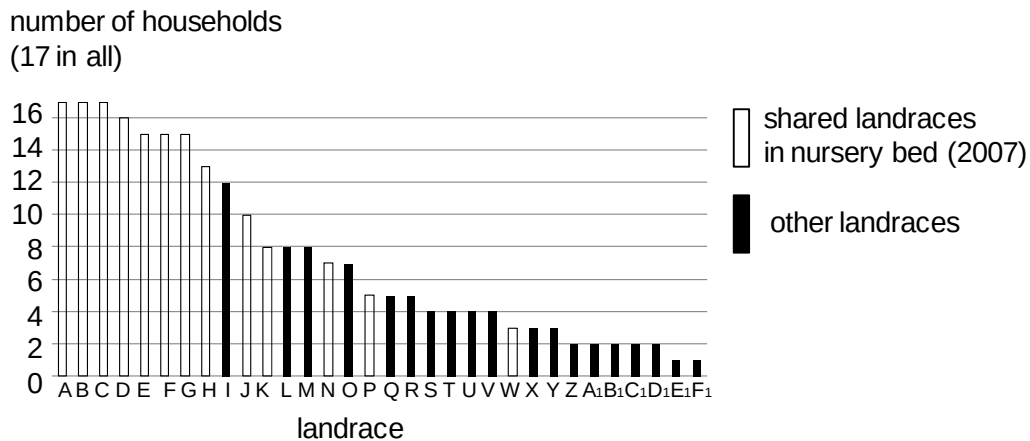


Figure 5: Distribution of landraces in a village



The other half seedlings distributed each household for transplanting randomly. There were 13 landraces in common nursery bed in 2007. They also exchange the suckers informally, that is same as the rest households.

4. Discussion

Here I compare landrace management of enset among local communities in Ethiopia with that of banana in Uganda from the viewpoint of peoples' practices. To complement my survey, I refer to the works of Brandt et al (1997) and Tesfaye and Ludders (2003) etc..

My research on the landrace diversity of bananas and local practices in Central Uganda

since 2001 (Sato 2007) collected about 50 landrace names in a village. It also revealed that people transmit their knowledge from parents to children in a household, and they accumulate landraces in their own gardens in their span of life. It is quite a contrast to the case study of enset. The systems of maintenance of landrace diversity is different from each other.

The first point of the difference is units of plants that people recognize in their cultivation. An enset plant can produce a large number of indefinite clonal buds at once by an artificial operation. In the highland of Sidama, people make close planting at nursery beds and even at gardens. People recognize the enset plants as a group. They also recognize as a landrace even at growth stage of young suckers. Once they transplant the suckers, plants tend to be recognized as an individual plant, too. It means that enset can be recognized both as an individual and a group. In Ethiopia, there are variation in enset cultivation systems (Brandt et al 1997) so that the pattern of recognition can be varied. For example, In some regions people do not subdivide a garden by growth stages. In other areas like as Gurage, they transplant an enset plant for many times in their cultivation system. In banana cultivation in Uganda, suckers are produced one by one, so that they tend to recognize it as an individual plant. A banana garden is not subdivided so clearly as an enset garden.

The second difference is the patterns of exchange of seedlings. The exchange system of bananas in Uganda is quite simple. It is rare that suckers of bananas are transferred for several tens of kilometre. There are several popular landraces in large area. They have similar landrace names among different ethnic groups (Karamura and Karamura 1994). Although, these landraces seems to be disseminated in longer time. On the other hand, enset seedlings have various ways of exchange. There are informal exchange with neighbours or relatives, and trades for long distance. It is often to sell them from highland to lowland. Tesfaye and Ludders (2003) suggests that it leads to the similarity of cultivated landraces between points distant from each other.

The third is on common ownerships of seedlings among households. Communal system of labour or land has not developed at agricultural area of banana. In Uganda, even the historical background of colonial period has supported the private ownership of lands in the Central region. On the other hand, in Ethiopia I observed that people cooperate the management of seedlings at common front yard. I suppose that the cooperation in a village influences their selection of cultivated landraces.

I provisionally summarize local practices on landraces of banana and enset as Table 3. This paper made clear that local managements of germplasm differ in the banana

cultivation in Uganda and enset cultivation in Ethiopia. The interview also revealed the difference of social networks for the exchange of suckers. They use various channel for the trade of enset suckers in Sidama, whereas they maintain relatively simple and moderate networks for the exchange of banana suckers in Uganda. These characteristics probably reflect the flows of suckers of bananas and enset.

Landrace diversities are maintained in different mechanisms of human intervention between the two crops. Universal value or criteria defined in international societies cannot explain cultural aspects on landrace diversity. The important is to look carefully the patterns of their cultivation, exchange of the germplasm and social networks.

Table 3: Comparison of local practices on landraces between banana in Uganda and enset in Ethiopia

	unit to be dealt with	exchange of seedling and its extent	share of seedling among households	social network
banana	individual plant	○ (trade is rarely) (long trade is rarely)	×	simple and moderate
enset	individual~group	⊙ (often both in exchange and trade) (neighbour~distant place)	× / ○	various channels

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